KCG
COLLEGE OF TECHNOLOGY
AFFILIATED TO ANNA UNIVERSITY | AUTONOMOUS

CURRICULUM AND SYLLABUS

UG

(3rd & 4th Semester)

(REGULATIONS 2023)

ACADEMIC YEAR 2024-2025

KCG COLLEGE OF TECHNOLOGY(AUTONOMOUS)

REGULATIONS 2023
B.E. AERONAUTICAL ENGINEERING
CHOICE BASED CREDIT SYSTEM
CURRICULUM FOR SEMESTERS I TO VIII

SEMESTER – I

SL NO	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
	23IP101	Induction Programme		-	-	-	-	-
THEORY								
1	23HS101	Essential Communication	HSMC	3	0	0	3	3
2	23MA101	Matrices and Calculus	BSC	3	0	0	3	3
3	23AD101	Programming in Python	ESC	3	0	0	3	3
4	23HS102	Heritage of Tamils	HSMC	1	0	0	1	1
THEORY AND PRACTICALS								
5	23PH111	Engineering Physics	BSC	3	0	2	5	4
6	23CY111	Engineering Chemistry	BSC	3	0	2	5	4
PRACTICALS								
7	23AD121	Python Programming Laboratory	ESC	0	0	4	4	2
8	23HS121	Communication Skills Laboratory	HSMC	0	0	2	2	1
9	23HS122	General Clubs / Technical Clubs / NCC / NSS / Extension Activities	HSMC	0	0	2	2	1*
TOTAL				**16**	**0**	**12**	**28**	**21**

SEMESTER – II

SL. NO	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
THEORY								
1	23HS201/ 202	Professional English /Foreign Language	HSMC	3	0	0	3	3
2	23MA201	Vector calculus &Complex Functions	BSC	3	1	0	4	4
3	23PH207	Applied Physics	BSC	3	0	0	3	3
4	23AE201	Elements of Aeronautical Engineering	PCC	3	0	0	3	3
5	23HS203	Tamils & Technology	HSMC	1	0	0	1	1
THEORY AND PRACTICALS								
6	23EE281	Basic Electrical and Electronics Engineering	ESC	2	0	advanced 2	4	3
7	23ME211	Engineering Graphics	ESC	3	0	2	5	4
PRACTICALS								
8	23ME221	Engineering Practices Laboratory	ESC	0	0	4	4	2
9	23AE221	Aero Modelling Lab	PCC	0	0	4	4	2
10	23ES291	Soft Skills	EEC	0	0	2	2	1*
TOTAL				**18**	**1**	**14**	**33**	**25**

SEMESTER – III

SL. NO	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
THEORY								
1	23MA302	Transforms and Partial Differential Equations	BSC	3	1	0	4	4
2	23AE301	Solid Mechanics	PCC	3	0	0	3	3
3	23HS301	Universal Human Values and Ethics	HSMC	3	0	0	3	3
THEORY AND PRACTICALS								
4	23ME312	Fluid Mechanics and Hydraulic Machinery	PCC	3	0	2	5	4
5	23AE311	Aero Engineering Thermodynamics	PCC	3	0	2	5	4
PRACTICALS								
6	23AE321	Strength of Materials Laboratory	PCC	0	0	4	4	2
7	23ES391	Presentation skills	EEC	0	0	2	2	1*
TOTAL				**15**	**1**	**10**	**26**	**20**

SEMESTER – IV

SL. NO	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
THEORY								
1	23MA403	Numerical And Statistical Methods	BSC	3	1	0	4	4
2	23AE401	Low-speed Aerodynamics	PCC	3	0	0	3	3
3	23AE402	Air Breathing Propulsion	PCC	3	0	0	3	3
4	23AE403	Aircraft Structures	PCC	3	0	0	3	3
5		Department Elective 1	DEC	3	0	0	3	3
6		Department Elective 2	DEC	3	0	0	3	3
PRACTICALS								
7	23AE421	Aerodynamics Laboratory	PCC	0	0	4	4	2
8	23AE422	Propulsion Laboratory	PCC	0	0	4	4	2
9	23ES491	Aptitude and Logical Reasoning 1	EEC	0	0	2	2	1*
10	23AE423	Mini Project	EEC	0	0	2	2	1
TOTAL				**18**	**1**	**12**	**31**	**24**

SEMESTER – V

SL. NO	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK L	T	P	TOTAL CONTACT PERIODS	CREDITS
THEORY								
1	23RE501	Research Methodology and Intellectual Property Rights	ESC	2	0	0	2	2
2	23AE501	Advanced Aerodynamics	PCC	3	0	0	3	3
3	23AE502	Advanced Aircraft Structures	PCC	3	0	0	3	3
4		Department Elective 3	DEC	3	0	0	3	3
5		Department Elective 4	DEC	3	0	0	3	3
6		Non-Department Elective - 1 (Emerging Technology)	NEC	3	0	0	3	3
PRACTICALS								
7	23AE521	Aircraft Structures Laboratory	PCC	0	0	4	4	2
8	23AE522	Computational Analysis Laboratory	PCC	0	0	2	2	1
9	23ES591	Aptitude and Logical Reasoning 2	EEC	0	0	2	2	1*
TOTAL				**17**	**0**	**8**	**25**	**20**

SEMESTER – VI

SL. NO	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK L	T	P	TOTAL CONTACT PERIODS	CREDITS
THEORY								
1		Department Elective 5	DEC	3	0	0	3	3
2		Department Elective 6	DEC	3	0	0	3	3
3		Non-Department Elective - 2 (Management / Safety Courses)	NEC	3	0	0	3	3
THEORY & PRACTICALS								
4	23CE611	Environmental Sciences and Engineering	ESC	3	0	2	5	4
5	23AE611	Flight Dynamics & Simulation	PCC	3	0	2	5	4
6	23AE612	Avionics	PCC	3	0	2	5	4
PRACTICALS								
7	23AE621	Project Work - Phase 1	EEC	0	0	4	4	2
8	23AE622	Technical Training	EEC	0	0	2	2	1
9	23AE623	Technical Seminar – 1	ESC	0	0	2	2	1
TOTAL				**18**	**0**	**14**	**32**	**25**

SEMESTER – VII

SL. NO	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
THEORY								
1		Non-Department Elective3 (Management and Safety Courses)	NEC	3	0	0	3	3
2	23AE701	UAV Systems	PCC	3	0	0	3	3
3	23AE702	Finite Element Method	PCC	3	0	0	3	3
4	23AE703	Comprehension	EEC	2	0	0	2	2
5	23AE704	Total Quality and Continuing Airworthiness	PCC	3	0	0	3	3
THEORY & PRACTICALS								
6	23AE711	Composite Materials and Structures	PCC	3	0	2	5	4
PRACTICALS								
7	23AE721	Aircraft Design Project	EEC	0	0	4	4	2
8	23AE722	Project Work - Phase 2	EEC	0	0	6	6	3
9	23AE723	Technical Seminar – 2	ESC	0	0	4	4	2
TOTAL				**17**	**0**	**16**	**33**	**25**

SEMESTER – VIII

SL. NO	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
PRACTICALS								
1	23AE821/ 23AE822	Internship/Capstone Project		0	0	20	20	10
TOTAL				**0**	**0**	**20**	**20**	**10**

TOTAL CREDITS: 170

PROFESSIONAL ELECTIVE COURSES

LIST OF IDENTIFIED VERTICALS	
1	Avionics and Drone Technology
2	Computational Engineering
3	Aerodynamics and Propulsion
4	Aerospace Structures
5	Aircraft Maintenance and Practices
6	Diversified Courses

VERTICAL 1: AVIONICS AND DRONE TECHNOLOGY

SL. NO	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1	23AE031	Drone rules and Aviation regulations	DEC	2	0	2	4	3
2	23AE032	Control Engineering	DEC	3	0	0	3	3
3	23AE033	Guidance and Control	DEC	3	0	0	3	3
4	23AE034	Navigation and Communication System	DEC	3	0	0	3	3
5	23AE035	Design of UAV systems	DEC	3	0	0	3	3
6	23AE036	Aerodynamics of Drones	DEC	3	0	0	3	3
7	23AE037	Drone Avionics	DEC	3	0	0	3	3
8	23AE038	Digital Image Processing in Drone	DEC	3	0	0	3	3

VERTICAL 2: COMPUTATIONAL ENGINEERING

SL. NO	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1	23AE039	Numerical Methods in Fluid Dynamics	DEC	3	0	0	3	3
2	23AE040	Computational Heat Transfer	DEC	3	0	0	3	3
3	23AE041	Basics of Computational Fluid Dynamics	DEC	3	0	0	3	3
4	23AE042	Computer Aided Design and Analysis	DEC	3	0	0	3	3
5	23AE043	Grid Generation Techniques	DEC	3	0	0	3	3
6	23ME033	Computer Integrated Manufacturing	DEC	3	0	0	3	3
7	23AE045	Boundary Layer Theory	DEC	3	0	0	3	3
8	23AE046	Programming Tools in Aerospace Engineering	DEC	3	0	0	3	3

VERTICAL 3: AERODYNAMICS AND PROPULSION

SL. NO	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1	23AE047	Experimental Aerodynamics	DEC	3	0	0	3	3
2	23AE048	High Speed Aerodynamics	DEC	3	0	0	3	3
3	23AE049	Industrial Aerodynamics	DEC	3	0	0	3	3
4	23AE050	Rocket Propulsion	DEC	3	0	0	3	3
5	23AE051	Advanced Propulsion Systems	DEC	3	0	0	3	3
6	23AE052	Hypersonic Aerodynamics	DEC	3	0	0	3	3
7	23AE053	Wind tunnel Techniques	DEC	3	0	0	3	3
8	23AE054	Helicopter Aerodynamics	DEC	3	0	0	3	3

VERTICAL 4: AEROSPACE STRUCTURES

SL. NO	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1	23AE055	Fatigue and Fracture Mechanics	DEC	3	0	0	3	3
2	23AE056	Experimental Stress Analysis	DEC	3	0	0	3	3
3	23AE057	Vibrations and Aero elasticity	DEC	3	0	0	3	3
4	23ME031	Additive Manufacturing	DEC	3	0	0	3	3
5	23ME036	Non-Destructive Testing and Evaluation	DEC	3	0	0	3	3
6	23AE060	Aerospace Materials	DEC	3	0	0	3	3
7	23AE061	Theory of Elasticity	DEC	3	0	0	3	3
8	23AE062	Spacecraft Structures	DEC	3	0	0	3	3

VERTICAL 5: AIRCRAFT MAINTENANCE AND PRACTICES

SL. NO	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1	23AE063	Airframe Maintenance and Repair	DEC	3	0	0	3	3
2	23AE064	Aircraft General Engineering and Maintenance Practices	DEC	3	0	0	3	3
3	23AE065	Civil Aviation Regulations	DEC	3	0	0	3	3
4	23AE066	Aircraft Engine Maintenance and Repair	DEC	3	0	0	3	3
5	23AE067	Air Traffic Control	DEC	3	0	0	3	3
6	23AE068	Airport Management	DEC	3	0	0	3	3
7	23AE069	Aircraft Safety & Operations	DEC	3	0	0	3	3
8	23AE070	Crisis Management in Aircraft Industry	DEC	3	0	0	3	3

VERTICAL 6: DIVERSIFIED COURSES

SL. NO	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1	23AE071	Manufacturing Technology	DEC	3	0	0	3	3
2	23AS701	Rockets and launch vehicles	DEC	3	0	0	3	3
3	23AE072	Drone Technologies	DEC	3	0	0	3	3
4	23AE073	Helicopter Maintenance	DEC	3	0	0	3	3
5	23AS601	Space Mechanics	DEC	3	0	0	3	3
6	23AE075	Theory of Machines	DEC	3	0	0	3	3
7	23AE076	High Temperature Materials	DEC	3	0	0	3	3
8	23AE077	Rockets and Missiles	DEC	3	0	0	3	3

NON-DEPARMENT ELECTIVE

EMERGING TECHNOLOGY

SL NO	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1	23NE971	Quantum Technology	NEC	3	0	0	3	3
2	23NE972	Block Chain Technology	NEC	3	0	0	3	3
3	23NE973	Artificial Intelligence and Machine Learning Fundamentals	NEC	3	0	0	3	3
4	23NE974	Augmented Reality and Virtual Reality	NEC	3	0	0	3	3
5	23NE975	IoT concepts and applications	NEC	3	0	0	3	3
6	23NE976	Data Science and Fundamentals	NEC	3	0	0	3	3
7	23NE990	Big Data Analytics	NEC	3	0	0	3	3

MANAGEMENT COURSES

SL NO	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1	23HS971	Total Quality Management	NEC	3	0	0	3	3
2	23HS972	Engineering Economics and Financial Accounting	NEC	3	0	0	3	3
3	23HS973	Engineering Management and Law	NEC	3	0	0	3	3
4	23HS974	Knowledge Management	NEC	3	0	0	3	3
5	23HS975	Industrial Management	NEC	3	0	0	3	3
6	23HS976	Entrepreneurship and Business Opportunities	NEC	3	0	0	3	3
7	23HS977	Modern Business Administration and Financing	NEC	3	0	0	3	3
8	23HS978	Essentials of Management	NEC	3	0	0	3	3

SAFETY COURSES

SL NO	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1	23HS979	Disaster Management	NEC	3	0	0	3	3
2	23HS980	Industrial Safety	NEC	3	0	0	3	3
3	23HS981	Automotive Safety	NEC	3	0	0	3	3

SEMESTER-WISE CREDIT DISTRIBUTION

SEMESTER	HSMC	BSC	ESC	PCC	DEC	NEC	EEC	Total
Semester I	5	11	5					**21**
Semester II	4	7	9	5				**25**
Semester III	3	4		13				**20**
Semester IV		4		13	6		1	**24**
Semester V			2	9	6	3		**20**
Semester VI			5	8	6	3	3	**25**
Semester VII			2	13		3	7	**25**
Semester VIII							10	**10**
B. E – Aeronautical Engineering	**12**	**26**	**23**	**61**	**18**	**9**	**21**	**170**

23MA302	TRANSFORMS AND PARTIAL DIFFERENTIAL EQUATIONS	L	T	P	C
		3	1	0	4

COURSE OBJECTIVES:

- To introduce the basic concepts of PDE for solving standard partial differential equations.
- To introduce Fourier series analysis which is central to many applications in engineering apart from its use in solving boundary value problems.
- To acquaint the student with Fourier series techniques in solving heat flow problems used in various situations.
- To acquaint the student with Fourier transform techniques used in wide variety of situations.
- To introduce the effective mathematical tools for the solutions of partial differential equations that model several physical processes and to develop Z transform techniques for discrete time systems

UNIT I PARTIAL DIFFERENTIAL EQUATIONS 9+3

Formation of partial differential equations –Solutions of standard types of first order partial differential equations - Lagrange's linear equation - Linear partial differential equations of second and higher order with constant coefficients of both homogeneous and non-homogeneous types.

UNIT II FOURIER SERIES 9+3

Dirichlet's conditions – General Fourier series – Odd and even functions – Half range sine series and cosine series – Root mean square value – Parseval's identity – Harmonic analysis.

UNIT III APPLICATIONS OF PARTIAL DIFFERENTIAL EQUATIONS 9+3

Classification of second order Quasi Linear PDE – Method of separation of variables - Fourier series solutions of one dimensional wave equation – One dimensional equation of Heat conduction – Steady state solution of two dimensional equation of heat conduction (Infinite) (Cartesian coordinates only)

UNIT IV FOURIER TRANSFORMS 9+3

Statement of Fourier integral theorem– Fourier transform pair – Fourier sine and cosine transforms – Properties – Transforms of simple functions – Convolution theorem (Without proof) – Parseval's identity.

UNIT V Z-TRANSFORMS AND DIFFERENCE EQUATIONS 9+3

Z-transforms - Elementary properties – Convergence of Z-transforms – Initial and final value theorems - Inverse Z-transform using partial fraction and convolution theorem - Formation of difference equations – Solution of difference equations using Z - transforms.

TOTAL: 60 PERIODS

COURSE OUTCOMES:

At the end of the course the students will be able to

CO 1 Understand how to solve the given standard partial differential equations.

CO 2 Understand Fourier series analysis which plays a vital role in engineering applications.

CO 3 Examine the physical significance of Fourier series techniques in solving one and two dimensional heat flow problems and one dimensional wave equations.

CO 4 Understand the mathematical principles on Fourier transforms to solve some of the physical problems of engineering.

CO 5 Understand Z transforms , inverse Z transforms and its elementary properties

CO 6 Apply the effective mathematical tools for the solutions of difference equations by using Z transform techniques for discrete time systems.

TEXT BOOKS:

1. Kreyszig.E, "Advanced Engineering Mathematics", John Wiley and Sons, 10th Edition, New Delhi, 2016.
2. Grewal.B.S., “Higher Engineering Mathematics”, Khanna Publishers, New Delhi, 44th Edition, 2018.
3. P.Sivaramakrishna Das and C.Vijayakumari “A Text Book on TPDE” Pearson Publications

REFERENCE BOOKS:

1. Narayanan. S., Manicavachagom Pillay.T.K and Ramanaiah.G "Advanced Mathematics for Engineering Students", Vol. II & III, S.Viswanathan Publishers Pvt. Ltd, Chennai, 1998.
2. Ramana. B.V., "Higher Engineering Mathematics", McGraw Hill Education Pvt. Ltd, New Delhi, 2018.

COs	**POs**												**PSOs**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
1	3	3	3	-	-	-	-	-	-	-	-	2	2	-	1
2	3	3	3	-	-	-	-	-	-	-	-	2	2	-	1
3	2	2	2	-	-	-	-	-	-	-	-	2	2	-	1
4	3	3	3	-	-	-	-	-	-	-	-	2	2	-	1
5	2	2	2	-	-	-	-	-	-	-	-	2	2	-	1
6	2	2	2	-	-	-	-	-	-	-	-	2	2	-	1
Overall correlation	3	3	2	-	-	-	-	-	-	-	-	2	2	-	1

23AE301 SOLID MECHANICS

L	T	P	C
3	0	0	3

COURSE OBJECTIVES:

- To think, Analyse and solve Engineering Problems expected from the course
- To understand stress and strain concepts related to deformable bodies
- To enable understanding of the behaviour and response of materials and to allow thestudent to carry out easy and moderate level structural analysis of basic structural members
- To familiarize with the different methods used for beam deflection analysis
- To impart knowledge to the students on how structural elements are sized and to enable the student to gain knowledge in how stresses are developed and distributedinternally

UNIT I SIMPLE STRESS AND STRAIN 9

Mechanical properties of materials; Stresses and strains; Hooke's law, elastic constant, relation between moduli, working stress, factor of safety, poisons ratio ; bars of varying cross section; Thermal stresses.

UNIT II TRANSFORMATION OF STRESS AND STRAIN 9

Plane stress and strain, Principal stresses, Mohr's circle and Hooke's law for plane stresses. Application of plane stress: Spherical and Cylindrical pressure vessel.

UNIT III SHEAR FORCE AND BENDING MOMENT 9

Types of loads- Types of Supports, Shear force and bending moment diagrams for simply supported and cantilever beams with concentrated, uniformly distributed and variableloads. Relation between load, shear force and bending moment.

UNIT IV STRESSES IN BEAMS 10

Theory of Simple Bending, Section modulus, Distribution of Bending stresses and Shearstress variation in beams of symmetric and unsymmetric sections; Beams of uniform strength; Flexural stresses: Bending equations, calculation of bending stresses for different sections of beams like I, L, T, C, angle section.

UNIT V TORSION 8

Torsional shear stress in solid, hollow and stepped circular shafts, angular deflection and power transmission capacity, Strain energy in torsion, Stresses in members subjected to combined axial, bending and torsional loads.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

At the end of the course the students will be able to

CO1: Analyse and solve Engineering Problems expected from the course

CO2: Analyze the stress and strain concepts related to deformable bodies

CO3: Identify the behaviour and response of materials and to allow the moderatelevel structural analysis of basic structural members

CO4: Summarize the different methods used for beam deflection analysis

CO5: Relate the structural elements sizing.

CO6: Solve the concepts used for stresses developed internally

TEXT BOOKS:

1. Beer Jr FP. E. Russell Johnston, John T. Dewolf, and David F. Mazurek. Mechanics ofMaterials. McGraw-Hill, New York. 2020.
2. Hibbeler RC. Statics and Mechanics of Materials in SI Units. Pearson Higher Ed; 2018.

REFERENCE BOOKS:

1. Egor P Popov, Mechanics of Materials, Pearson, 2015
2. James M. Gere, Mechanics of Materials, Sixth Edition, Thomson Learning, 2004.
3. William F. Riley, Leroy D. Sturges, Don H. Morris, Mechanics of Materials, John Wiley& Sons, 2006.
4. Arthur P. Boresi, Richard J. Schmidt, Advanced Mechanics of Materials, 6th Edition,Wiley India Pvt. Limited.2002.

COs	POs												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	3	2	1	-	-	-	-	-	-	-	-	-	2	-	-
2	3	2	1	-	-	-	-	-	-	-	-	-	3	-	-
3	3	2	1	-	-	-	-	-	-	-	-	-	3	-	-
4	3	2	1	-	-	-	-	-	-	-	-	-	3	-	-
5	3	2	1	-	-	-	-	-	-	-	-	-	3	-	-
6	3	2	1	-	-	-	-	-	-	-	-	-	3	-	-
Overall correlation	3	2	1	-	-	-	-	-	-	-	-	-	3	-	-

23HS301	UNIVERSAL HUMAN VALUES AND ETHICS	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- Development of a holistic perspective based on self-exploration about themselves (human being), family, society and nature/existence.
- Understanding (or developing clarity) of the harmony in the human being, family, society and nature/existence.
- Strengthening of self-reflection.
- Development of commitment and courage to act.

UNIT I COURSE INTRODUCTION 9

Need, Basic Guidelines, Content and Process for Value Education - Understanding the need, basic guidelines, content and process for Value Education -Self Exploration–what is it? - its content and process; 'Natural Acceptance' and Experiential Validation- as the mechanism for self exploration - Continuous Happiness and Prosperity- A look at basic Human Aspirations -Right understanding, Relationship and Physical Facilities- the basic requirements for fulfilment of aspirations of every human being with their correct priority -Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario -Method to fulfil the above human aspirations: understanding and living in harmony at various levels.

UNIT II UNDERSTANDING HARMONY IN THE HUMAN BEING 9

Harmony in Myself- Understanding human being as a co-existence of the sentient 'I' and the material 'Body' -Understanding the needs of Self ('I') and 'Body' - Sukh and Suvidha-Understanding the Body as an instrument of 'I' (I being the doer, seer and enjoyer) - Understanding the characteristics and activities of 'I' and harmony in 'I' -Understanding the harmony of I with the Body: Sanyam and Swasthya; correct appraisal of Physical needs, meaning of Prosperity.

UNIT III UNDERSTANDING HARMONY IN THE FAMILY AND SOCIETY 9

Harmony in Human-Human Relationship -Understanding Harmony in the family – the basic unit of human interaction -Understanding values in human-human relationship; meaning of Nyaya and program for its fulfilment to ensure satisfaction; Trust(Vishwas) and Respect as the foundational values of relationship -Understanding the meaning of Vishwas; Difference between intention and competence -Understanding the meaning of Samman, Difference between respect and differentiation; the other salient values in relationship -Understanding the harmony in the society (society being an extension of family)-Visualizing a universal harmonious order in society- Undivided Society (Akhand Samaj), Universal Order- from family to world family.

UNIT IV ENGINEERING ETHICS **9**

Senses of ‗Engineering Ethics„ – Variety of moral issues – Types of inquiry – Moral dilemmas – Moral Autonomy – Kohlberg's theory – Gilligan's theory – Consensus and Controversy – Models of professional roles - Theories about right action – Self-interest – Customs and Religion – Uses of Ethical Theories.

UNIT V SAFETY, RESPONSIBILITY AND RIGHTS **9**

Safety and Risk – Assessment of Safety and Risk – Risk Benefit Analysis and Reducing Risk - Respect for Authority – Collective Bargaining – Confidentiality – Conflicts of Interest – Occupational Crime – Professional Rights – Employee Rights – Intellectual Property Rights (IPR) – Discrimination-Moral Leadership –Code of Conduct – Corporate Social Responsibility.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

At the end of the course the students will be able to

CO1: Understand the need of value education.

CO2: Comprehend the difference between self and body.

CO3: Understand the need to exist as an unit of Family and society.

CO4: Understand Harmony at all levels.

CO5: Apply the values acquired in the professional front.

CO6: Identify appropriate technologies for ecofriendly production systems.

TEXT BOOKS:

1. Human Values and Professional Ethics by R R Gaur, R Sangal, G P Bagaria, Excel Books, New Delhi, 2010 3.
2. Mike W. Martin and Roland Schinzinger, ―Ethics in Engineering‖, Tata McGraw Hill, New Delhi, 2003.
3. Govindarajan M, Natarajan S, Senthil Kumar V. S, ―Engineering Ethics‖, Prentice Hall of India, New Delhi, 2004

REFERENCE BOOKS:

1. Jeevan Vidya: Ek Parichaya, A Nagaraj, Jeevan Vidya Prakashan, Amarkantak, 1999.
2. Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004.
3. The Story of Stuff (Book).
4. The Story of My Experiments with Truth - by Mohandas Karamchand Gandhi AICTE Model Curriculum in Humanities, Social Science and Management Courses (UG Engineering & Technology) 169 | Page .
5. Small is Beautiful - E. F Schumacher.
6. Slow is Beautiful - Cecile Andrews.
7. Economy of Permanence - J C Kumarappa 8. Bharat Mein Angreji Raj – Pandit Sunderlal.

8. Rediscovering India - by Dharampal.
9. Hind Swaraj or Indian Home Rule - by Mohandas K. Gandhi .
10. India Wins Freedom - Maulana Abdul Kalam Azad.
11. Vivekananda - Romain Rolland (English) 13. Gandhi - Romain Rolland (English).
12. Charles B. Fleddermann, ―Engineering Ethics‖, Pearson Prentice Hall, New Jersey, 2004.
13. Charles E. Harris, Michael S. Pritchard and Michael J. Rabins, ―Engineering Ethics – Concepts and Cases‖, Cengage Learning, 2009.

WEB SOURCES:

1. www.onlineethics.org
2. www.nspe.org
3. www.globalethics.org

COs	POs												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	-	-	-	-	-	3	3	3	3	3	-	-	-	-	3
2	-	-	-	-	-	3	3	3	3	3	-	-	-	-	3
3	-	-	-	-	-	3	3	3	3	3	-	-	-	-	3
4	-	-	-	-	-	3	3	3	3	3	-	-	-	-	3
5	-	-	-	-	-	3	3	3	3	3	-	-	-	-	3
6	-	-	-	-	-	3	3	3	3	3	-	-	-	-	3
Overall correlation	-	-	-	-	-	3	3	3	3	3	-	-	-	-	3

23ME312	FLUID MECHANICS AND HYDRAULIC MACHINERY	L	T	P	C
		3	0	2	4

COURSE OBJECTIVES:

- Study about the properties of the fluids and behavior of fluids under static conditions.
- Gain basic knowledge of the dynamics of fluids and boundary layer concepts.
- Study the applications of the conservation laws to flow measurements, flow through pipes and forces on pipe bends.
- Learn the significance of boundary layer theory and its thicknesses.
- Study the basic principles of working and design of Pelton wheel, Francis and Kaplan turbine.
- Acquire knowledge on working principles of centrifugal, reciprocating and rotary pumps.

UNIT I FLUID PROPERTIES AND FLOW CHARACTERISTICS 9+6

Fluid Definition and Classification – Properties of fluids, Fluid statics - Pressure Measurements - Buoyancy and floatation - forces on submerged bodies, stability of floating bodies, Flow characteristics - Concept of control volume and system – Velocity potential and stream functions, Continuity equation, energy equation and momentum equation - Applications.

UNIT II FLOW THROUGH PIPES AND BOUNDARY LAYER 9+6

Reynold's Experiment - Laminar flow through circular conduits - Darcy Weisbach equation - friction factor - Moody diagram - Major and minor losses - Hydraulic and energy gradient lines - Pipes in series and parallel - Boundary layer concepts - Types of boundary layer thickness.

UNIT III DIMENSIONAL ANALYSIS AND MODEL STUDIES 9+6

Fundamental dimensions - Dimensional homogeneity - Rayleigh's method and Buckingham Pi theorem - Dimensionless parameters - Similitude and model studies - Distorted and undistorted models.

UNIT IV TURBINES 9+6

Impact of jets - Velocity triangles - Theory of rotodynamic machines - Classification of turbines - Working principles - Pelton wheel - Modern Francis turbine - Kaplan turbine - Work done - Efficiencies - Draft tube - Specific speed - Performance curves for turbines - Governing of turbines.

UNIT V PUMPS 9+6

Classification of pumps - Centrifugal pumps - Working principle - Heads and efficiencies– Velocity triangles - Work done by the impeller - Performance curves - Reciprocating pump working principle - Indicator diagram and it's variations - Work saved by fitting air vessels - Rotary pumps.

TOTAL: 75 PERIODS

LIST OF EXPERIMENTS

1. Determination of coefficient of discharge of a venturimeter.
2. Determination of coefficient of discharge of an orificemeter.
3. Determination of friction factor for flow through pipes.
4. Determination of metacentric height.
5. Characteristics of centrifugal pumps.
6. Characteristics of reciprocating pump.
7. Characteristics of gear pump.
8. Characteristics of Pelton wheel turbine.
9. Rotameter.
10. Characteristics of Francis wheel turbine.

COURSE OUTCOMES:

At the end of the course the students will be able to

CO1: Apply the conservation laws applicable to fluids and its application through fluid kinematics and dynamics and also to understand the properties and behavior of fluids in static conditions.

CO2: Estimate the losses in pipelines for both laminar and turbulent conditions and analysis of pipes connected in series and parallel.

CO3: Apply the concept of boundary layer and its thickness on the flat solid surface.

CO4: Formulate the relationship among the parameters involved in the given fluid phenomenon and to predict the performances of prototype by model studies.

CO5: Design the various types of turbines and to explain its working principles.

CO6: Design the various types of pumps and to explain its working principles.

TEXT BOOKS:

1. Modi P.N. and Seth, S.M. Hydraulics and Fluid Mechanics, Standard Book House, New Delhi, 22nd edition (2019).
2. R K Bansal, A Text Book of Fluid Mechanics and Hydraulic Machines, Laxmi Publications, New Delhi.

REFERENCE BOOKS:

1. Streeter, V. L. and Wylie E. B., Fluid Mechanics, McGraw Hill Publishing Co., 2010.
2. Cengel Y A and Cimbala J M, Fluid Mechanics, McGraw Hill Education Pvt. Ltd., 2014.
3. S K Som; Gautam Biswas and S Chakraborty, Introduction to Fluid Mechanics and Fluid Machines, Tata McGraw Hill Education Pvt. Ltd., 2012.

COs	**POs**												**PSOs**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
1	3	3	2	2	1	2	2	1	2	1	1	1	3	2	2
2	3	3	2	2	1	2	2	1	2	1	1	1	3	2	2
3	3	3	2	2	1	2	2	1	2	1	1	1	3	2	2
4	3	3	2	2	1	2	2	1	2	1	1	1	3	2	2
5	3	3	2	2	1	2	2	1	2	1	1	1	3	2	2
6	3	3	2	2	1	2	2	1	2	1	1	1	3	2	2
Overall correlation	3	3	2	2	1	2	2	1	2	1	1	1	3	2	2

23AE311 AERO ENGINEERING THERMODYNAMICS

L	T	P	C
3	0	2	4

COURSE OBJECTIVES:

- To understand the basic concepts of thermodynamics systems and the application offirst law of thermodynamics to open and closed systems.
- To understand the concept of second law of thermodynamics and entropy.
- To derive fundamental relations between thermodynamic properties.
- To comprehend the operational principles of piston engines and jet engines, as wellas their air standard cycles.
- To understand the behavior of pure substances and its application to produce power.
- To understand the basic of heat transfer and the application on real time problem.

UNIT I FUNDAMENTAL CONCEPT AND FIRST LAW 9

Concept of continuum, macroscopic approach, thermodynamic systems – closed, open and isolated. Property, state, path and process, quasi-static process, work, internal energy, enthalpy, specific heat capacities and heat transfer, Zeroth law of thermodynamics, First law of thermodynamics, relation between pressure, volume and temperature for various processes, SFEE, application of SFEE to jet engine components.

UNIT II SECOND - LAW AND ENTROPY 9

Second law of thermodynamics – Equivalence between Kelvin Planck and Clausius statements. Reversibility and Irreversibility, Thermal reservoir, Carnot theorem. Carnotcycle, Reversed Carnot cycle, efficiency, COP, Thermodynamic temperature scale - Clausius inequality, Concept of entropy, Entropy changes for various processes.

UNIT III AIR STANDARD CYCLES 9

Otto, Diesel, Dual and Brayton cycles – - Air standard efficiency – Mean effective pressure.

UNIT IV FUNDAMENTALS OF VAPOUR POWER CYCLES 9

Properties of pure substances – solid, liquid and vapour phases, phase rule, p-v, p-T, T- v, T-s, h-s diagrams, p-v-T surfaces, thermodynamic properties of steam - standard Rankine cycle, Reheat and Regeneration cycle. Heat rate, Specific steam consumption, Tonne of refrigeration.

UNIT V BASICS OF PROPULSION AND HEAT TRANSFER 9

Classification of jet engines - basic jet propulsion arrangement – Engine station number,thrust equation – Specific thrust, SFC, TSFC, specific impulse, conduction in parallel, radial and composite wall, Basics of convective and radiation heat transfer.

TOTAL: 45 PERIODS

LIST OF EXPERIMENTS

1. Draw the Valve timing diagram of 4-Stroke engine and the Port timing diagram of 2-Stroke engine.
2. Performance test on a 4-Stroke diesel engine.
3. Determination of specific heat of solid by Bomb calorimeter.
4. Determine the COP of a Refrigeration System.
5. Determine the COP of a the Air-conditioning System.
6. Determination of effectiveness of a parallel flow and counter flow heat exchangerand calculate the overall heat transfer coefficient (u) in the parallel flow heat exchanger.
7. Determination of effectiveness of a counter flow heat exchanger and calculate theoverall heat transfer coefficient (u) in the counter flow heat exchanger.
8. Determination of convective heat transfer coefficient during free and forced convection.
9. Determination of thermal conductivity of a metal.
10. Determination of thermal conductivity of a composite wall.

COURSE OUTCOMES:

At the end of the course the students will be able to

CO1: Apply first law of thermodynamics to solve problems related to open and closedsystems

CO2: Apply the second law of thermodynamics to Engineering devices.

CO3: Estimate the efficiency and performance of various air standard cycles

CO4: Determine efficiency and performance of vapor power cycle.

CO5: Calculate thermodynamics problems related to conduction, convention and radiation

CO6: Determine the jet engine performance by applying thermodynamics properties.

TEXT BOOKS:

1. Nag. P. K., "Engineering Thermodynamics", 6th Edition, Tata McGraw-Hill,New Delhi, 2017.
2. Cengel, Y, M. Boles and M. Kanoğlu, Thermodynamics - An Engineering Approach, Tata McGraw Hill,8thEdition, 2015.
3. Holman.J.P., "Thermodynamics", 3rd Edition, McGraw-Hill, 2007.

REFERENCE BOOKS:

1. Rathakrishnan E., "Fundamentals of Engineering Thermodynamics", 2nd Edition, Prentice-Hall India, 2011.
2. Arora C.P, "Thermodynamics", Tata McGraw-Hill, New Delhi, 2017.
3. R.K.Rajput, "A text book of Engineering Thermodynamics", Fifth Edition, Lakshmi Publications, New Delhi, 2016.

4. Merala C, Pother, Craig W, Somerton, “Thermodynamics for Engineers”, Schaum Outline Series,Tata McGraw-Hill, New Delhi, 2004.

COs	POs												PSOs		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
1	3	2	2	1	1	-	1	-	-	-	1	2	3	1	-
2	3	2	2	1	1	1	1	-	-	-	1		3	2	1
3	3	2	2	1	1	1	1	1	-	1	-	2	3	2	-
4	3	2	2	1	1	-	-	-	-	-	1	1	3	1	-
5	3	3	3	2	2	-	1	-	-	-	1	2	3	1	-
6	3	2	2	1	1	1	1	-	-	1	1	2	3	3	1
Overall correlation	3	3	3	2	2	1	1	1	-	1	1	2	3	2	1

23AE321 STRENGTH OF MATERIALS LABORATORY

	L	T	P	C
	0	0	4	2

COURSE OBJECTIVES:

- To determine experimental data, include universal testing machines and torsionequipment.
- To understand experimental data for spring testing machine, compression testingmachine, impact tester, hardness tester.
- To study stress analysis and design of beams subjected to bending and shearing loadsusing several methods.
- To make use of Flexural strength of a beam.
- To understand experimental stress with compression tests.

LIST OF EXPERIMENTS

1. Tension test on a mild steel rod & Plastics.
2. Compression on UTM.
3. Double shear test
    - Mild steel rods
    - Aluminum rods.
4. Torsion test on mild steel rod.
5. Impact test on metal & Composite specimen.
    - Charpy Test
    - Izod Test
6. Hardness test on metals
    - Brinell Hardness Number.
    - Rockwell Hardness Number.
7. Deflection test on beams
    - Cantilever Hardness Number.
    - Simply supported beams.
8. Compression test on helical springs.
    - Open coil Spring
    - Closed coil spring
9. Effect of hardening- Improvement in hardness
10. Microscopic Examination of Hardened samples and Tempered samples

COURSE OUTCOMES:

At the end of the course the students will be able to

CO 1: Analyse and design structural members subjected to tension, compression, torsion, bending and combined stresses using the fundamental concepts of stress, strain and elastic behaviour of materials.

CO 2: Examine the basic concepts of stress, strain, deformation, and material behavior under different types of loading (axial, torsion, bending).

CO 3: Examine stress analysis, design of beams subjected to bending and shearing loads using several methods.

CO 4: Examine the stresses and strains in axially loaded members subject to flexural loadings.

CO 5: Inspect the compression strength of the cast iron and steel.

CO 6: Analyse the changes that occur during the hardening of the material

COs	POs												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	3	3	2	2	2	2	2	2	3	1	-	1	2	-	-
2	3	3	2	2	2	2	2	2	3	1	-	1	3	-	-
3	3	3	2	2	2	2	2	2	3	1	-	1	3	-	-
4	3	3	2	2	2	2	2	2	3	1	-	1	3	-	-
5	3	3	2	2	2	2	2	2	3	1	-	1	3	-	-
6	3	3	2	2	2	2	2	2	3	1	-	1	3	-	-
Overall correlation	3	3	2	2	2	2	2	2	3	1	-	1	3	-	-

23ES391 PRESENTATION SKILLS

	L	T	P	C
	0	0	2	1*

COURSE OBJECTIVES:

- To help learners use brainstorming techniques for generating, organizing and outlining ideas.
- To familiarize learners with different speech structures by engaging them in watching speeches with great opening and closing.
- To give practice on voice modulation and use of body language and eye contact for making captivating presentations.
- To give hands on training on preparing presentation slides and using remote presentation tools.
- To train students on responding to question and feedback with confidence.

UNIT I BRAINSTORMING AND OUTLINING 6

Mind Mapping based on prior knowledge, collecting additional information from external resources, giving prompts to Generative AI tools seeking information, organizing ideas generated, knowing your audience.

UNIT II STRUCTURING THE PRESENTATION 6

3 Ts of a presentation, writing effective introduction- Beginning the introduction with a hook (question, data, storytelling) and closing the introduction with the objective of the presentation. Structuring the body paragraphs -Choosing key ideas from the list of ideas generated during brainstorming. Substantiating ideas with examples, data, reasons and anecdotes. Summarizing the ideas for conclusion.

UNIT III DELIVERY TECHNIQUES 6

Vocal variety, intonation, reducing filler words and improving articulation, inflection, engaging the audience. Body language- eye contact, gestures, movement on stage.

UNIT IV USE OF TECHNOLOGICAL AIDS 6

Use of presentation software like MS Power Point, Google Slides etc, incorporating images, graphs, charts and videos, using interactive tools like quizzes and polls, using remote presentation tools like zoom, MS Teams, WebEx for screen sharing, virtual whiteboards and chat functionalities, incorporating AR/VR for more immersive presentations .

UNIT V HANDLING QUESTIONS AND FEEDBACK 6

Audience engagement through questions, PAR (Point, Answer, Redirect) strategy for structuring responses to questions. Understanding feedback process - Receiving, interpreting and evaluating constructively, active listening techniques for processing feedback, responding to feedback- acknowledging, clarifying and appreciating, Dealing with challenging feedback.

TOTAL: 30 PERIODS

COURSE OUTCOMES:

After completion of the course, the students should be able to

CO1 construct ideas for presentation through mind mapping techniques.

CO2 organize ideas and structure the presentation with captivating introduction, body paragraphs illustrated with examples and reasons and compelling conclusion.

CO3 apply vocal variety and body language techniques to enhance delivery.

CO4 prepare engaging presentations by integrating multimedia elements.

CO5 demonstrate proficiency in delivering presentations in remote platforms utilizing various technological tools and strategies to engage audience in virtual environments.

CO6 exhibit active listening skills by responding to questions with clarity and confidence and incorporating constructive feedback for professional development.

TEXT BOOKS:

1. "Slide:ology: The Art and Science of Creating Great Presentations" by Nancy Duarte. O'Reilly Media.
2. "The Naked Presenter: Delivering Powerful Presentations With or Without Slides" by Garr Reynolds. New Riders.

REFERENCE BOOK:

Talk Like TED: The 9 Public-Speaking Secrets of the World's Top Minds" by Carmine Gallo.

23MA403 NUMERICAL AND STATISTICAL METHODS

L	T	P	C
3	1	0	4

COURSE OBJECTIVES:

- provide the necessary basic concepts of a few statistical and numerical methods and give procedures for solving numerically different kinds of problems occurring in engineering and technology.
- acquaint the knowledge of testing of hypothesis for small and large samples which plays an important role in real life problems
- introduce the basic concepts of solving algebraic and transcendental equations.
- introduce the numerical techniques of interpolation in various intervals and numerical techniques of differentiation and integration which plays an importantrole in engineering and technology
- acquaint the knowledge of various techniques and methods of solving ordinary differential equations.

UNIT I TESTING OF HYPOTHESIS 9+3

Sampling distributions – Standard error - Large sample test for single mean, proportion, difference of means – Small sample Tests– t Test for single mean and difference of means - F test for equality of variance – Chi square test for single variance- Independence of attribute-Goodness of fit (Binomial Distribution, PoissonDistribution).

UNIT II DESIGN OF EXPERIMENTS 9+3

One way and two way classifications - Completely randomized design – Randomized block design – Latin square design.

UNIT III SOLUTION OF EQUATIONS AND EIGENVALUE PROBLEMS 9+3

Solution of algebraic and transcendental equations - Fixed point iteration method – Newton Raphson method- Solution of linear system of equations - Gauss elimination method – Pivoting - Gauss Jordan method – Iterative methods of GaussJacobi and Gauss Seidel - Eigenvalues of a square matrix by Power method.

UNIT IV INTERPOLATION, NUMERICAL DIFFERENTIATION AND NUMERICAL INTEGRATION 9+3

Interpolation - Newton‘s forward and backward difference interpolation -Lagrange‘s and Newton‘s divided difference interpolations –– Approximation of derivative using interpolation polynomials – Numerical single integration and double integrations using Trapezoidal and Simpson‘s 1/3rules.

UNIT V NUMERICAL SOLUTION OF ORDINARY DIFFERENTIAL EQUATIONS 9+3

Single step methods: Taylor‘s series method - Euler‘s method - Modified Euler‘s method - Fourth order Runge-Kutta method for solving first order differential equations - Multi step methods: Milne‘s and Adam‘s Bashforth method.

TOTAL: 60 PERIODS

COURSE OUTCOMES:

At the end of the course the students will be able to

CO1: Analyze the given data for large and small samples.

CO2: Analyze the problems involving design of experiments.

CO3: Determine numerical solutions for nonlinear (algebraic or transcendental) equations, large system of linear equations and Eigen value problem of a matrix, when analytical methods fail to give solution.

CO4: Distinguish the Newton's forward, backward, divided difference, Lagrange's in finding the intermediate values of the experimental data and solving the problems using numerical differentiation and integration.

CO5: Solve numerically, ordinary differential equations which is used to solve different kinds of problems occurring in engineering and technology.

TEXT BOOKS:

1. Grewal, B.S., and Grewal, J.S., "Numerical Methods in Engineering and Science", Khanna Publishers, 10th Edition, New Delhi, 2015.
2. Johnson, R.A., Miller, I and Freund J., ―Miller and Freund's Probability and Statistics for Engineers", Pearson Education, Asia, 8th Edition,2015.

REFERENCE BOOKS:

1. Dr.P.Sivaramakrishnadas, Dr. C.Vijayakumari, ―Statistics and Numerical Methods‖ Pearson Publications.
2. Burden, R.L and Faires,J.D,"Numerical Analysis‖, 9th Edition, Cengage Learning,2016.
3. Devore.J.L.‖Probability and Statistics for Engineering and the Sciences‖, Cengage Learning, NewDelhi, 8th Edition,2014.
4. Gerald.C.F. and Wheatley.P.O. "Applied Numerical Analysis‖ Pearson Education, Asia, New Delhi, 7th Edition, 2007.

CO	POs												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	3	2	1	1	-	-	-	-	-	-	-	1	3	-	-
2	3	2	1	1	-	-	-	-	-	-	-	1	3	-	-
3	3	2	1	1	-	-	-	-	-	-	-	1	3	-	-
4	3	2	1	1	-	-	-	-	-	-	-	1	3	-	-
5	3	2	1	1	-	-	-	-	-	-	-	1	3	-	-
6	3	2	1	1	-	-	-	-	-	-	-	1	3	-	-
Overall correlation	3	2	1	1	-	-	-	-	-	-	-	1	3	-	-

23AE401 LOW - SPEED AERODYNAMICS

L	T	P	C
3	0	0	3

COURSE OBJECTIVES:

- To make the students acquainted with the concepts of mass, momentum and energy conservation relating to aerodynamics.
- To familiarize the Navier Stroke equations and its application
- To make the student realize the concept of vorticity, irrotationality, theory of airfoil and wing sections.
- To familiarize the basics of viscous flow.
- To make the student to understand the different boundary layers and Blasius Solution
- To acquaint the students the basics of turbulence flow

UNIT I INTRODUCTION TO LOW-SPEED FLOW 9

Euler equation, incompressible Bernoulli's equation. circulation and vorticity, green's lemma and Stoke's theorem, barotropic flow, kelvin's theorem, streamline, stream function, irrotational flow, potential function, Equipotential lines, elementary flows and their combinations.

UNIT II TWO-DIMENSIONAL INVISCID INCOMPRESSIBLE FLOW 9

Ideal Flow over a circular cylinder, D'Alembert's paradox, magnus effect, Kutta - Joukowski's theorem, starting vortex, Kutta condition, real flow over smooth and rough cylinder.

UNIT III AIRFOIL THEORY 9

Cauchy-Riemann relations, complex potential, methodology of conformal transformation, Kutta-Joukowski transformation and its applications, thin airfoil theory and its applications.

UNIT IV SUBSONIC WING THEORY 9

Vortex filament, Biot and Savart law, bound vortex and trailing vortex, horse shoe vortex, lifting line theory and its limitations.

UNIT V INTRODUCTION TO BOUNDARY LAYER THEORY 9

Boundary layer and boundary layer thickness, displacement thickness, momentum thickness, energy thickness, shape parameter, boundary layer equations for steady, two-dimensional incompressible flow, boundary layer growth over a flat plate, critical Reynolds number, Blasius solution, basics of turbulent flow.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

At the end of the course the students will be able to

CO1: Apply the basics physics for low-speed flows.

CO2: Apply the concept of 2D, inviscid incompressible flows in low-speed aerodynamics.

CO3: Solve lift generation problems using aerofoil theories.

CO4: Make use of lifting line theory for solving flow properties.

CO5: Solve the boundary layer equations for a steady, two-dimensional incompressibleflow

CO6: Explain the properties of the turbulent flow.

TEXT BOOKS:

1. Houghton, E.L., and Caruthers, N.B., "Aerodynamics for Engineering students",Edward Arnold Publishers Ltd., London, 1989
2. Anderson, J.D., "Fundamentals of Aerodynamics", McGraw Hill Book Co., 2010
3. E Rathakrishnan, "Theoretical Aerodynamics", John Wiley, NJ, 2013

REFERENCE BOOKS:

1. Clancey, L J.," Aerodynamics", Pitman, 1986
2. John J Bertin., "Aerodynamics for Engineers", Pearson Education Inc, 2002
3. Kuethe, A.M and Chow, C.Y, "Foundations of Aerodynamics", Fifth Edition, John Wiley & Sons, 2000.
4. Milne Thomson, L.H., "Theoretical Aerodynamics", Macmillan, 1985

COs	POs												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	3	2	1	1	1	-	-	-	-	1	1	1	3	2	-
2	3	2	1	1	2	-	-	-	-	1	1	1	3	2	-
3	3	3	2	-	2	-	-	-	-	1	1	2	3	1	-
4	3	2	1	1	2	-	-	-	-	1	1	1	3	1	-
5	3	2	1	1	2	-	-	-	-	1	1	1	3	2	-
6	3	3	2	-	2	1	1	2	-	1	1	2	1	2	2
Overall correlation	3	3	2	1	2	1	1	2	-	1	1	2	3	2	2

23AE402 AIR BREATHING PROPULSION

L	T	P	C
3	0	0	3

COURSE OBJECTIVES:

- To establish fundamental approach and application of jet engine components.
- To learn about the analysis of flow phenomenon and estimation of thrust developed by jet Engine
- To introduce about the application of various equations in Gas Turbine Engines.
- To learn the concepts of jet engine combustion chambers
- To acquire knowledge on compressors and turbines

UNIT I PRINCIPLES OF AIR BREATHING ENGINES 9

Operating principles of piston engines – thermal efficiency calculations – classification of piston engines - illustration of working of gas turbine engines – factors affecting thrust –methods of thrust augmentation – performance parameters of jet engines.

UNIT II JET ENGINE INTAKES AND EXHAUST NOZZLES 9

Ram effect, Internal flow and Stall in subsonic inlets – relation between minimum area ratio and external deceleration ratio – diffuser performance – modes of operation - supersonic inlets – starting problem on supersonic inlets – shock swallowing by area variation – real flow through nozzles and nozzle efficiency – losses in nozzles – ejector and variable area nozzles – thrust reversal.

UNIT III JET ENGINE COMBUSTION CHAMBERS 9

Chemistry of combustion, Combustion equations, Combustion process, classification of combustion chambers – combustion chamber performance – effect of operating variables on performance – flame stabilization, Cooling process, Materials, Aircraft fuels, sustainable aviation and zero emission fuels.

UNIT IV JET ENGINE COMPRESSORS 9

Euler's turbo machinery equation, Principle, operation of centrifugal compressor, Principle, operation of axial flow compressor– Work done and pressure rise – velocity diagrams – degree of reaction – free vortex and constant reaction designs of axial flow compressor – performance parameters axial flow compressors– stage efficiency

UNIT V JET ENGINE TURBINES 9

Principle of operation of axial flow turbines– limitations of radial flow turbines- Work done and pressure rise – Velocity diagrams – degree of reaction – constant nozzle angle designs – performance parameters of axial flow turbine– turbine blade cooling methods– stage efficiency calculations – basic blade profile design considerations – matching ofcompressor and turbine

TOTAL: 45 PERIODS

COURSE OUTCOMES:

At the end of the course the students will be able to

CO1: Develop the principal figures of merit & develop the principal design parametersand constraints that set the performance of air-breathing propulsion systems.

CO2: Utilize the working operation and effective application with the knowledge ofperformance and losses found in Inlets.

CO3: Explain the combustion chamber working and performance.

CO4: Solve complex problems in compressors used in aircraft.

CO5: Solve complex problems in turbines used in aircraft engine.

CO6: Outline the various functions of nozzle.

TEXT BOOKS:

1. Hill, P.G. & Peterson, C.R. "Mechanics & Thermodynamics of Propulsion" Pearson education (2009).
2. Cohen, H. Rogers, G.F.C. and Saravanamuttoo, H.I.H. "Gas Turbine Theory", Pearson Education Canada; 6th edition, 2008.

REFERENCE BOOKS:

1. Mathur, M.L. and Sharma, R.P., "Gas Turbine, Jet and Rocket Propulsion", Standard Publishers & Distributors, Delhi, 2nd edition 2014.
2. Oates, G.C., "Aero thermodynamics of Aircraft Engine Components", AIAA Education Series, New York, 1985.
3. "Rolls Royce Jet Engine", Rolls Royce; 4th revised edition, 1986
4. Shankar Ayyappan., "Air Breathing Propulsion", S Lakshmi Publications.,
5. Mattingly, Jack D. Elements of propulsion: gas turbines and rockets. AmericanInstitute of Aeronautics and Astronautics, 2006.

COs	POs												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	3	2	1	-	-	-	-	-	-	-	-	-	2	-	-
2	3	2	1	-	-	-	-	-	-	-	-	-	3	-	-
3	3	2	1	-	-	-	-	-	-	-	-	-	3	-	-
4	3	2	1	-	-	-	-	-	-	-	-	-	3	-	-
5	3	2	1	-	-	-	-	-	-	-	-	-	3	-	-
6	3	2	1	-	-	-	-	-	-	-	-	-	3	-	-
Overall correlation	3	2	1	-	-	-	-	-	-	-	-	-	3	-	-

23AE403 AIRCRAFT STRUCTURES

	L	T	P	C
	3	**0**	**0**	**3**

COURSE OBJECTIVES:

- To provide the students an understanding on the linear static analysis of determinateand indeterminate aircraft structural components.
- To provide the students an understanding on energy methods to staticallydeterminate and indeterminate structures.
- To make the students to create a structure to carry the given load.
- To make the students to calculate the response of statically indeterminate structuresunder various loading conditions.
- To provide the design process using different failure theories.

UNIT I STATICALLY DETERMINATE & INDETERMINATE STRUCTURES 9

Plane truss analysis – method of joints – method of sections – method of shear – 3-D trusses – principle of super position, Clapeyron's 3 moment equation and moment distribution method for indeterminate beams.

UNIT II ENERGY METHODS 9

Strain Energy in axial, bending, torsion and shear loadings. Castigliano's theorems and their applications. Energy theorems – dummy load & unit load methods – energy methods applied to statically determinate and indeterminate beams, frames, rings & trusses.

UNIT III COLUMNS 9

Euler's column curve – inelastic buckling – effect of initial curvature – Southwell plot – columns with eccentricity – use of energy methods – theory of beam columns – beam columns with different end conditions – stresses in beam columns.

UNIT IV FAILURE THEORIES 9

Ductile and brittle materials – maximum principal stress theory - maximum principal strain theory - maximum shear stress theory - distortion energy theory – octahedral shear stress theory.

UNIT V INDUCED STRESSES 9

Thermal stresses – impact loading – Fatigue – Creep - Stress Relaxation

TOTAL: 45 PERIODS

COURSE OUTCOMES:

At the end of the course the students will be able to

CO1: Analyse the determinate and indeterminate aircraft structural components using linear static analysis.

CO2: Apply the energy methods to determine the reactions of structure.

CO3: Calculate the response of Columns under various loading conditions.

CO4: Design the component using different theories of failure.

CO5: Examine the structure under induced stress.

CO6: Calculate the response of Beam Columns under various loading conditions.

TEXT BOOKS:

1. James M. Gere & Barry J Goodno, " Mechanics of Materials ", cengage Learning Custom Publishing; 8th edition, 2012.
2. Megson T M G, `Aircraft Structures for Engineering students' Butterworth-Heinemann publisher, 5th edition,

REFERENCE BOOKS:

1. Bruhn E F, 'Analysis and Design of Flight Vehicle Structures', Tri-State Off-set Company, USA, 1985
2. Donaldson, B.K., 'Analysis of Aircraft Structures - An Introduction' Cambridge University Press publishers, 2nd edition, 2008
3. Peery, D.J., and Azar, J.J., Aircraft Structures, 2nd edition, McGraw – Hill, N.Y.,1999.
4. N.C. Pandya, C.S. Shah, "Elements of Machine Design", Charotar Publishing House, 15th edition, 2009.

COs	POs												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	3	2	1	-	-	-	-	-	-	-	-	-	2	-	-
2	3	2	1	-	-	-	-	-	-	-	-	-	3	-	-
3	3	2	1	-	-	-	-	-	-	-	-	-	3	-	-
4	3	2	1	-	-	-	-	-	-	-	-	-	3	-	-
5	3	2	1	-	-	-	-	-	-	-	-	-	3	-	-
6	3	2	1	-	-	-	-	-	-	-	-	-	3	-	-
Overall Correlation	3	2	1	-	-	-	-	-	-	-	-	-	3	-	-

23AE421 AERODYNAMICS LABORATORY

L	T	P	C
0	0	4	2

COURSE OBJECTIVES:

- To understand pressure distribution and characteristic over an airfoil and bluffbodies due to airflow.
- To measure the forces and moments acting on the airfoil at different angle ofattack using wind tunnel balance set up.
- To visualize the flow pattern over an object by different method.

LIST OF EXPERIMENTS :

1. Calibration of a subsonic Wind tunnel.
2. Determination of lift for the given airfoil section.
3. Pressure distribution over a smooth circular cylinder.
4. Pressure distribution over a rough circular cylinder.
5. Pressure distribution over a symmetric airfoil.
6. Pressure distribution over a cambered airfoil.
7. Force measurement using wind tunnel balancing setup.
8. Force measurement and flow visualization of VTOL model at low speeds.
9. Flow visualization over a flat plate at different angles of incidence.
10. Flow visualization studies in low speed flows over cylinders.
11. Flow visualization studies in low speed flows over airfoil with different angle of incidence.
12. Flow visualization on bluff bodies using water flow channel.
13. Flow visualization using Hele-shaw apparatus

TOTAL : 30 PERIODS

COURSE OUTCOMES:

At the end of the course the students will be able to

CO1: Calculate the aerodynamic forces and moments experienced by airfoils, wings andbluff bodies at different velocities.

CO2: Calculate the aerodynamic forces and moments experienced by airfoils, wings andbluff bodies at different angle of attack

CO3: Evaluate the performance of thin airfoils with the effects of angle of attack by considering thin airfoil theory

CO4: Illustrate the limits and usefulness of the experimental approach.

CO5: Demonstrate the experimental findings in clear oral and concise report

CO6: Illustrate the limits and usefulness of the experimental approach on comparing withtheoretical approach.

COs	POs												PSOs		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
1	3	3	3	2	2	1	1	2	3	3	2	2	3	2	2
2	3	3	3	1	2	1	1	2	3	3	2	2	3	2	2
3	3	3	2	2	2	1	1	1	3	3	1	1	3	2	2
4	3	3	2	1	1	1	2	2	3	3	2	1	3	2	2
5	3	3	2	1	1	1	1	2	2	2	2	2	3	1	2
6	3	3	2	1	1	1	1	2	2	2	2	2	3	1	2
Overall correlation	3	3	2	1	1	1	1	2	3	3	2	2	3	2	2

23AE422 PROPULSION LABORATORY **L T P C**

0 0 4 2

COURSE OBJECTIVES:

- To explore practically components of aircraft piston and gas turbine engines andtheir working principles.
- To impart practical knowledge of flow phenomenon of subsonic and supersonicjets.
- To determine practically thrust developed by rocket propellants.

LIST OF EXPERIMENTS :

1. Study of aircraft piston & gas turbine engines and its components.
2. Determine the velocity profiles of free jets.
3. Determine Velocity profiles of wall jets.
4. Wall pressure measurements of a subsonic diffusers and ramjet ducts.
5. Flame stabilization studies using conical and hemispherical flame holders.
6. Cascade testing of compressor blades.
7. Velocity and pressure measurements high - speed jets.
8. Wall Pressure measurements of supersonic nozzle.
9. Wall pressure measurements on supersonic inlet.
10. Flow visualization of supersonic flow.
11. Performance test of propeller.
12. Orsat Apparatus.
13. Experiment on Plasma thruster under vacuum condition.

TOTAL : 30 PERIODS

COURSE OUTCOMES:

At the end of the course the students will be able to

CO1: Identify components and information of piston and gas turbine engine.

CO2: Analyze the behaviour of flow through ducts and jet engine components to distinguish subsonic and supersonic flow characteristics.

CO3: Visualize flow phenomenon in supersonic flow.

CO4: Analyze the testing of compressor blades

CO5: Analyze the subsonic flow for engine components

CO6: Testing the performance of a Propeller.

COs	POs												PSCOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	3	2	1	1	1	-	-	-	-	-	-	-	2	2	-
2	3	2	1	2	1	-	-	-	-	-	-	-	3	2	-
3	3	2	1	2	2	-	-	-	-	-	-	-	3	2	-
4	3	2	1	1	1	-	-	-	-	-	-	-	2	2	-
5	3	2	1	2	1	-	-	-	-	-	-	-	3	2	-
6	3	2	1	2	2	-	-	-	-	-	-	-	3	2	-
Overall correlation	3	2	1	2	2	-	-	-	-	-	-	-	3	2	-

23ES491 APTITUDE AND LOGICAL REASONING –I

	L	T	P	C
	0	**0**	**2**	**1**

COURSE OBJECTIVES:

- To improve the problem solving and logical thinking ability of the students.
- To acquaint student with frequently asked questions and patterns in quantitative aptitude and logical reasoning.

UNIT I **4**

Numbers, LCM, HCF, Averages, Ratio & Proportion, Mixtures & Allegation.

UNIT II **4**

Percentages, Time and work, Pipes and Cistern, coding and decoding.

UNIT III **4**

Time Speed Distance, Train, Boats and Streams, Analogy.

UNIT IV **4**

Data Interpretation(BAR,PIE,LINE), Seating arrangement.

UNIT V **4**

Simple Interest and Compound Interest, Profit loss and Discount, Partnership.

TOTAL: 20 PERIODS

COURSE OUTCOMES:

At the end of the course the students will be able to

CO 1 Understand the basic concepts of quantitative ability.

CO 2 Understand the basic concepts of logical reasoning Skills.

CO 3 Increase in critical thinking skills.

CO 4 Able to solve campus placements aptitude papers covering Quantitative Ability, Logical Reasoning Ability.

TEXT BOOK:

APTIPEDIA, 2nd edition, Wiley Publishers.

REFERENCE BOOKS:

1. Quantitative Aptitude – R.S. Agarwal.
2. A Modern Approach To Verbal & Non-Verbal Reasoning By R S Agarwal.

KCG COLLEGE OF TECHNOLOGY (AUTONOMOUS)
REGULATIONS 2023
B.E. AEROSPACE ENGINEERING
CHOICE BASED CREDIT SYSTEM
CURRICULUM FOR SEMESTERS I TO VIII

SEMESTER – I

SL NO	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
	23IP101	Induction Programme		-	-	-	-	-
THEORY								
1	23HS101	Essential Communication	HSMC	3	0	0	3	3
2	23MA101	Matrices and Calculus	BSC	3	0	0	3	3
3	23AD101	Programming in Python	ESC	3	0	0	3	3
4	23HS102	Heritage of Tamils	HSMC	1	0	0	1	1
THEORY AND PRACTICALS								
5	23PH111	Engineering Physics	BSC	3	0	2	5	4
6	23CY111	Engineering Chemistry	BSC	3	0	2	5	4
PRACTICALS								
7	23AD121	Python Programming Laboratory	ESC	0	0	4	4	2
8	23HS121	Communication Skills Laboratory	HSMC	0	0	2	2	1
9	23HS122	General Clubs / Technical Clubs / NCC / NSS / Extension Activities	HSMC	0	0	2	2	1*
TOTAL				**16**	**0**	**12**	**28**	**21**

SEMESTER – II

SL NO	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
THEORY								
1	23HS201/ 23HS202	Professional English / Foreign Language	HSMC	3	0	0	3	3
2	23MA203	Statistics and Numerical Methods	BSC	3	1	0	4	4
3	23PH207	Applied Physics	BSC	3	0	0	3	3
4	23AS201	Elements of Aerospace Engineering	PCC	3	0	0	3	3
5	23HS203	Tamils and Technology	HSMC	1	0	0	1	1
THEORY AND PRACTICALS								
6	23EE281	Basic Electrical and Electronics Engineering	ESC	2	0	2	4	3
7	23ME211	Engineering Graphics	ESC	3	0	2	5	4
PRACTICALS								
8	23ME221	Engineering Practices Laboratory	ESC	0	0	4	4	2
9	23AS221	Aerospace Modelling Laboratory	PCC	0	0	4	4	2
10	23ES291	Soft Skills	EEC	0	0	2	2	1*
TOTAL				**18**	**1**	**14**	**33**	**25**

SEMESTER – III

SL NO	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
THEORY								
1	23MA302	Transforms and Partial Differential Equations	BSC	3	1	0	4	4
2	23AE301	Solid Mechanics	PCC	3	0	0	3	3
3	23HS301	Universal Human Values and Ethics	HSMC	3	0	0	3	3
THEORY AND PRACTICALS								
4	23ME312	Fluid Mechanics and Hydraulic Machinery	PCC	3	0	2	5	4
5	23AE311	Aero Engineering Thermodynamics	PCC	3	0	2	5	4
PRACTICALS								
6	23AE321	Strength of Materials Laboratory	PCC	0	0	4	4	2
7	23ES391	Presentation skills	EEC	0	0	2	2	1*
TOTAL				**15**	**1**	**10**	**26**	**20**

SEMESTER – IV

SL NO	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
THEORY								
1	23MA403	Numerical And Statistical Methods	BSC	3	1	0	4	4
2	23AS401	Aerodynamics	PCC	3	0	0	3	3
3	23AS402	Aerospace Propulsion	PCC	3	0	0	3	3
4	23AS403	Aerospace Structural Mechanics	PCC	3	0	0	3	3
5		Department Elective - 1	DEC	3	0	0	3	3
6		Department Elective - 2	DEC	3	0	0	3	3
PRACTICALS								
7	23AS421	Low- And High-Speed Aerodynamics Laboratory	PCC	0	0	4	4	2
8	23AS422	Aerospace Structures Laboratory	PCC	0	0	4	4	2
9	23ES491	Aptitude and Logical Reasoning 1	EEC	0	0	2	2	1*
10	23AS423	Mini Project 1	EEC	0	0	2	2	1
TOTAL				**18**	**1**	**12**	**31**	**24**

SEMESTER – V

SL NO	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
THEORY								
1	23RE501	Research Methodology & Intellectual Property Rights	ESC	2	0	0	2	2
2	23AS501	Advanced Propulsion	PCC	3	0	0	3	3
3		Department Elective 3	DEC	3	0	0	3	3
4		Department Elective 4	DEC	3	0	0	3	3
5		Non-Department Elective - 1 (Emerging Technology)	NEC	3	0	0	3	3
THEORY AND PRACTICALS								
6	23AE611	Flight Dynamics and Simulation	PCC	3	0	2	5	4
PRACTICALS								
7	23AS521	Space Propulsion Laboratory	PCC	0	0	4	4	2
8	23AE522	Computational Analysis Laboratory	PCC	0	0	2	2	1
9	23AS522	Space Launch Vehicle Design Project	EEC	0	0	4	4	2
10	23ES591	Aptitude and Logical Reasoning 2	EEC	0	0	2	2	1*
TOTAL				**17**	**0**	**14**	**31**	**23**

SEMESTER – VI

SL NO	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
THEORY								
1		Department Elective 5	DEC	3	0	0	3	3
2		Department Elective 6	DEC	3	0	0	3	3
3		Non-Department Elective- 2 (Management/Safety Courses)	NEC	3	0	0	3	3
4	23AS601	Space Mechanics	PCC	3	0	0	3	3
THEORY AND PRACTICALS								
5	23CE611	Environmental Sciences and Engineering	ESC	3	0	2	5	4
6	23AS612	Avionics	PCC	3	0	2	5	4
PRACTICALS								
7	23AS621	Project Work - Phase 1	EEC	0	0	4	4	2
8	23AS622	Technical Training	EEC	0	0	2	2	1
9	23AS623	Technical Seminar– 1	ESC	0	0	2	2	1
TOTAL				**18**	**0**	**12**	**30**	**24**

SEMESTER – VII

SL NO	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK L	T	P	TOTAL CONTACT PERIODS	CREDITS
THEORY								
1		Non-Department Elective-3 (Management Courses)	NEC	3	0	0	3	3
2	23AS701	Rocket and launch Vehicle	PCC	3	0	0	3	3
3	23AE702	Finite Element Method	PCC	3	0	0	3	3
4	23AS702	Comprehension	EEC	2	0	2	2	2
5	23AE704	Total Quality and Continuing Airworthiness	PCC	3	0	0	3	3
THEORY AND PRACTICALS								
6	23AE711	Composite Materials and Structures	PCC	3	0	2	5	4
PRACTICALS								
7	23AS722	Project Work - Phase 2	EEC	0	0	4	4	3
8	23AS723	Technical Seminar – 2	ESC	0	0	4	4	2
TOTAL				**17**	**0**	**12**	**27**	**23**

SEMESTER – VIII

SL NO	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK L	T	P	TOTAL CONTACT PERIODS	CREDITS
PRACTICALS								
1	23AS821/ 23AS622	Internship/Capstone Project	EEC	0	0	20	20	10
TOTAL				**0**	**0**	**20**	**20**	**10**

TOTAL CREDITS: 170

VERTICAL 1: SPACE TECHNOLOGY

SL NO	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1	23AS031	Cryogenics	DEC	3	0	0	3	3
2	23AS032	High Temperature Gas Dynamics	DEC	3	0	0	3	3
3	23AS033	Launch Vehicle Aerodynamics	DEC	3	0	0	3	3
4	23AS034	Orbital Mechanics	DEC	3	0	0	3	3
5	23AS035	Launch Vehicle Configuration Design	DEC	3	0	0	3	3
6	23AS036	Space Missions	DEC	3	0	0	3	3
7	23AS037	Geospatial Information Systems	DEC	3	0	0	3	3
8	23AS038	Space Exploration	DEC	3	0	0	3	3

VERTICAL 2: COMPUTATIONAL ENGINEERING

SL NO	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1	23AE039	Numerical Methods in Fluid Dynamics	DEC	3	0	0	3	3
2	23AE040	Computational Heat Transfer	DEC	3	0	0	3	3
3	23AE041	Basics of Computational Fluid Dynamics	DEC	3	0	0	3	3
4	23AE042	Computer Aided Design and Analysis	DEC	3	0	0	3	3
5	23AE043	Grid Generation Techniques	DEC	3	0	0	3	3
6	23AE033	Computer Integrated Manufacturing	DEC	3	0	0	3	3
7	23AE045	Boundary Layer Theory	DEC	3	0	0	3	3
8	23AE046	Programming Tools in Aerospace Engineering	DEC	3	0	0	3	3

VERTICAL 3: AERODYNAMICS AND PROPULSION

SL NO	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1	23AE047	Experimental Aerodynamics	DEC	3	0	0	3	3
2	23AE048	Highspeed Aerodynamics	DEC	3	0	0	3	3
3	23AE049	Industrial Aerodynamics	DEC	3	0	0	3	3
4	23AE050	Rocket Propulsion	DEC	3	0	0	3	3
5	23AE051	Advanced Propulsion Systems	DEC	3	0	0	3	3
6	23AE052	Hypersonic Aerodynamics	DEC	3	0	0	3	3
7	23AE053	Wind tunnel Techniques	DEC	3	0	0	3	3
8	23AE054	Helicopter Aerodynamics	DEC	3	0	0	3	3

VERTICAL 4: AEROSPACE STRUCTURES

SL NO	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1	23AE055	Fatigue and Fracture Mechanics	DEC	3	0	0	3	3
2	23AE056	Experimental Stress Analysis	DEC	3	0	0	3	3
3	23AE057	Vibrations and Aero Elasticity	DEC	3	0	0	3	3
4	23ME031	Additive Manufacturing	DEC	3	0	0	3	3
5	23ME036	Non-Destructive Testing and Evaluation	DEC	3	0	0	3	3
6	23AE060	Aerospace Materials	DEC	3	0	0	3	3
7	23AE061	Theory of Elasticity	DEC	3	0	0	3	3
8	23AE062	Spacecraft Structures	DEC	3	0	0	3	3

VERTICAL 5: AIRCRAFT MAINTENANCE AND PRACTICES

SL NO	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1	23AE063	Airframe Maintenance and Repair	DEC	3	0	0	3	3
2	23AE064	Aircraft General Engineering and Maintenance Practices	DEC	3	0	0	3	3
3	23AE065	Civil Aviation Regulations	DEC	3	0	0	3	3
4	23AE066	Aircraft Engine Maintenance and Repair	DEC	3	0	0	3	3
5	23AE067	Air Traffic Control	DEC	3	0	0	3	3
6	23AE068	Airport Management	DEC	3	0	0	3	3
7	23AE069	Aircraft Safety & Operations	DEC	3	0	0	3	3
8	23AE070	Crisis Management in Aircraft Industry	DEC	3	0	0	3	3

VERTICAL 6: SATELLITE TECHNOLOGY

SL NO	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1	23AS039	Spacecraft Power Systems	DEC	3	0	0	3	3
2	23AS040	Satellite Navigation and Control	DEC	3	0	0	3	3
3	23AS041	Spacecraft Sensors and Instrumentation	DEC	3	0	0	3	3
4	23AS042	Spacecraft Systems Engineering	DEC	3	0	0	3	3
5	23AS043	Satellite Architecture	DEC	3	0	0	3	3
6	23AS044	Spacecraft Dynamics	DEC	3	0	0	3	3
7	23AS045	Space Science & Science Environment	DEC	3	0	0	3	3
8	23AS046	Satellite Communication	DEC	3	0	0	3	3

VERTICAL 7: DIVERSIFIED COURSES

SL NO	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1	23AE071	Manufacturing Technology	DEC	3	0	0	3	3
2	23AE072	Drone Technologies	DEC	3	0	0	3	3
3	23AS047	Space Weapons and Warfare	DEC	3	0	0	3	3
4	23AS048	Turbo machines	DEC	3	0	0	3	3
5	23AS049	Heat Transfer in Space Applications	DEC	3	0	0	3	3
6	23AS050	Digital Image Processing in Aerospace Applications	DEC	3	0	0	3	3
7	23AE075	Theory of Machines	DEC	3	0	0	3	3
8	23AE076	High Temperature Materials	DEC	3	0	0	3	3

NON-DEPARMENT ELECTIVE

EMERGING TECHNOLOGY

SL NO	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK L	T	P	TOTAL CONTACT PERIODS	CREDITS
1	23NE971	Quantum Technology	NEC	3	0	0	3	3
2	23NE972	Block Chain Technology	NEC	3	0	0	3	3
3	23NE973	Artificial Intelligence and Machine Learning Fundamentals	NEC	3	0	0	3	3
4	23NE974	Augmented Reality and Virtual Reality	NEC	3	0	0	3	3
5	23NE975	IoT concepts and applications	NEC	3	0	0	3	3
6	23NE976	Data Science and Fundamentals	NEC	3	0	0	3	3
7	23NE990	Big Data Analytics	NEC	3	0	0	3	3

MANAGEMENT COURSES

SL NO	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK L	T	P	TOTAL CONTACT PERIODS	CREDITS
1	23HS971	Total Quality Management	NEC	3	0	0	3	3
2	23HS972	Engineering Economics and Financial Accounting	NEC	3	0	0	3	3
3	23HS973	Engineering Management and Law	NEC	3	0	0	3	3
4	23HS974	Knowledge Management	NEC	3	0	0	3	3
5	23HS975	Industrial Management	NEC	3	0	0	3	3
6	23HS976	Entrepreneurship and Business Opportunities	NEC	3	0	0	3	3
7	23HS977	Modern Business Administration and Financing	NEC	3	0	0	3	3
8	23HS978	Essentials of Management	NEC	3	0	0	3	3

SAFETY COURSES

SL NO	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK L	T	P	TOTAL CONTACT PERIODS	CREDITS
1	23HS979	Disaster Management	NEC	3	0	0	3	3
2	23HS980	Industrial Safety	NEC	3	0	0	3	3
3	23HS981	Automotive Safety	NEC	3	0	0	3	3

SEMESTER-WISE CREDIT DISTRIBUTION

SEMESTER	HSMC	BSC	ESC	PCC	DEC	NEC	EEC	Total
Semester I	5	11	5					**21**
Semester II	4	7	9	5				**25**
Semester III	3	4		13				**20**
Semester IV		4		13	6		1	**24**
Semester V			2	10	6	3	2	**23**
Semester VI			5	7	6	3	3	**24**
Semester VII			2	13		3	5	**23**
Semester VIII							10	**10**
B. E. – Aerospace Engineering	**12**	**26**	**23**	**61**	**18**	**9**	**21**	**170**

23MA302	**TRANSFORMS AND PARTIAL DIFFERENTIAL EQUATIONS**	**L**	**T**	**P**	**C**
		3	**1**	**0**	**4**

COURSE OBJECTIVES:

- To introduce the basic concepts of PDE for solving standard partial differential equations.
- To introduce Fourier series analysis which is central to many applications in engineering apart from its use in solving boundary value problems.
- To acquaint the student with Fourier series techniques in solving heat flow problems used in various situations.
- To acquaint the student with Fourier transform techniques used in wide variety of situations.
- To introduce the effective mathematical tools for the solutions of partial differential equations that model several physical processes and to develop Z transform techniques for discrete time systems

UNIT I PARTIAL DIFFERENTIAL EQUATIONS 9+3

Formation of partial differential equations –Solutions of standard types of first order partial differential equations - Lagrange's linear equation - Linear partial differential equations of second and higher order with constant coefficients of both homogeneous and non-homogeneous types.

UNIT II FOURIER SERIES 9+3

Dirichlet's conditions – General Fourier series – Odd and even functions – Half range sine series and cosine series – Root mean square value – Parseval's identity – Harmonic analysis.

UNIT III APPLICATIONS OF PARTIAL DIFFERENTIAL EQUATIONS 9+3

Classification of second order Quasi Linear PDE – Method of separation of variables - Fourier series solutions of one dimensional wave equation – One dimensional equation of Heat conduction – Steady state solution of two dimensional equation of heat conduction (Infinite) (Cartesian coordinates only).

UNIT IV FOURIER TRANSFORMS 9+3

Statement of Fourier integral theorem– Fourier transform pair – Fourier sine and cosine transforms – Properties – Transforms of simple functions – Convolution theorem (Without proof) – Parseval's identity.

UNIT V Z-TRANSFORMS AND DIFFERENCE EQUATIONS 9+3

Z-transforms - Elementary properties – Convergence of Z-transforms – Initial and final value theorems - Inverse Z-transform using partial fraction and convolution theorem - Formation of difference equations – Solution of difference equations using Z - transforms.

TOTAL: 60 PERIODS

COURSE OUTCOMES:

At the end of the course the students will be able to

CO 1 Understand how to solve the given standard partial differential equations.

CO 2 Understand Fourier series analysis which plays a vital role in engineering applications.

CO 3 Examine the physical significance of Fourier series techniques in solving one and two dimensional heat flow problems and one dimensional wave equations.

CO 4 Understand the mathematical principles on Fourier transforms to solve some of the physical problems of engineering.

CO 5 Understand Z transforms , inverse Z transforms and its elementary properties.

CO 6 Apply the effective mathematical tools for the solutions of difference equations by using Z transform techniques for discrete time systems.

TEXT BOOKS:

1. Kreyszig.E, "Advanced Engineering Mathematics", John Wiley and Sons, 10th Edition, New Delhi, 2016.
2. Grewal.B.S., "Higher Engineering Mathematics", Khanna Publishers, New Delhi, 44th Edition, 2018.
3. P.Sivaramakrishna Das and C.Vijayakumari "A Text Book on TPDE" Pearson Publications.

REFERENCE BOOKS:

1. Narayanan. S., Manicavachagom Pillay.T.K and Ramanaiah.G "Advanced Mathematics for Engineering Students", Vol. II & III, S.Viswanathan Publishers Pvt. Ltd, Chennai, 1998.
2. Ramana. B.V., "Higher Engineering Mathematics", McGraw Hill Education Pvt. Ltd, New Delhi, 2018.

COs	**POs**												**PSOs**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
1	3	3	3	-	-	-	-	-	-	-	-	2	2	-	1
2	3	3	3	-	-	-	-	-	-	-	-	2	2	-	1
3	2	2	2	-	-	-	-	-	-	-	-	2	2	-	1
4	3	3	3	-	-	-	-	-	-	-	-	2	2	-	1
5	2	2	2	-	-	-	-	-	-	-	-	2	2	-	1
6	2	2	2	-	-	-	-	-	-	-	-	2	2	-	1
Overall correlation	3	3	2	-	-	-	-	-	-	-	-	2	2	-	1

23AE301 SOLID MECHANICS

L	T	P	C
3	0	0	3

COURSE OBJECTIVES:

- To think, Analyse and solve Engineering Problems expected from the course.
- To understand stress and strain concepts related to deformable bodies.
- To enable understanding of the behaviour and response of materials and to allow thestudent to carry out easy and moderate .level structural analysis of basic structural members.
- To familiarize with the different methods used for beam deflection analysis.
- To impart knowledge to the students on how structural elements are sized and to enable the student to gain knowledge in how stresses are developed and distributedinternally.

UNIT I SIMPLE STRESS AND STRAIN 9

Mechanical properties of materials; Stresses and strains; Hooke's law, elastic constant, relation between moduli, working stress, factor of safety, poisons ratio ; bars of varying cross section; Thermal stresses.

UNIT II TRANSFORMATION OF STRESS AND STRAIN 9

Plane stress and strain, Principal stresses, Mohr's circle and Hooke's law for plane stresses. Application of plane stress: Spherical and Cylindrical pressure vessel.

UNIT III SHEAR FORCE AND BENDING MOMENT 9

Types of loads- Types of Supports, Shear force and bending moment diagrams for simply supported and cantilever beams with concentrated, uniformly distributed and variableloads. Relation between load, shear force and bending moment.

UNIT IV STRESSES IN BEAMS 10

Theory of Simple Bending, Section modulus, Distribution of Bending stresses and Shearstress variation in beams of symmetric and unsymmetric sections; Beams of uniform strength; Flexural stresses: Bending equations, calculation of bending stresses for different sections of beams like I, L, T, C, angle section.

UNIT V TORSION 8

Torsional shear stress in solid, hollow and stepped circular shafts, angular deflection and power transmission capacity, Strain energy in torsion, Stresses in members subjected to combined axial, bending and torsional loads.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

At the end of the course the students will be able to

CO1: Analyse and solve Engineering Problems expected from the course

CO2: Analyze the stress and strain concepts related to deformable bodies

CO3: Identify the behaviour and response of materials and to allow the moderatelevel structural analysis of basic structural members

CO4: Summarize the different methods used for beam deflection analysis

CO5: Relate the structural elements sizing.

CO6: Solve the concepts used for stresses developed internally

TEXT BOOKS:

1. Beer Jr FP. E. Russell Johnston, John T. Dewolf, and David F. Mazurek. Mechanics ofMaterials. McGraw-Hill, New York. 2020.
2. Hibbeler RC. Statics and Mechanics of Materials in SI Units. Pearson Higher Ed; 2018.

REFERENCE BOOKS:

1. Egor P Popov, Mechanics of Materials, Pearson, 2015
2. James M. Gere, Mechanics of Materials, Sixth Edition, Thomson Learning, 2004.
3. William F. Riley, Leroy D. Sturges, Don H. Morris, Mechanics of Materials, John Wiley& Sons, 2006.
4. Arthur P. Boresi, Richard J. Schmidt, Advanced Mechanics of Materials, 6th Edition,Wiley India Pvt. Limited.2002.

COs	POs												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	3	2	1	-	-	-	-	-	-	-	-	-	2	-	-
2	3	2	1	-	-	-	-	-	-	-	-	-	3	-	-
3	3	2	1	-	-	-	-	-	-	-	-	-	3	-	-
4	3	2	1	-	-	-	-	-	-	-	-	-	3	-	-
5	3	2	1	-	-	-	-	-	-	-	-	-	3	-	-
Overall correlation	3	2	1	-	-	-	-	-	-	-	-	-	3	-	-

23HS301 UNIVERSAL HUMAN VALUES AND ETHICS

	L	T	P	C
	3	0	0	3

COURSE OBJECTIVES:

- Development of a holistic perspective based on self-exploration about themselves (human being), family, society and nature/existence.
- Understanding (or developing clarity) of the harmony in the human being, family, society and nature/existence.
- Strengthening of self-reflection.
- Development of commitment and courage to act.

UNIT I COURSE INTRODUCTION 9

Need, Basic Guidelines, Content and Process for Value Education - Understanding the need, basic guidelines, content and process for Value Education -Self Exploration–what is it? - its content and process; 'Natural Acceptance' and Experiential Validation- as the mechanism for self exploration - Continuous Happiness and Prosperity- A look at basic Human Aspirations -Right understanding, Relationship and Physical Facilities- the basic requirements for fulfilment of aspirations of every human being with their correct priority -Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario -Method to fulfil the above human aspirations: understanding and living in harmony at various levels.

UNIT II UNDERSTANDING HARMONY IN THE HUMAN BEING 9

Harmony in Myself- Understanding human being as a co-existence of the sentient 'I' and the material 'Body' -Understanding the needs of Self ('I') and 'Body' - Sukh and Suvidha- Understanding the Body as an instrument of 'I' (I being the doer, seer and enjoyer) - Understanding the characteristics and activities of 'I' and harmony in 'I' -Understanding the harmony of I with the Body: Sanyam and Swasthya; correct appraisal of Physical needs, meaning of Prosperity.

UNIT III UNDERSTANDING HARMONY IN THE FAMILY AND SOCIETY 9

Harmony in Human-Human Relationship -Understanding Harmony in the family – the basic unit of human interaction -Understanding values in human-human relationship; meaning of Nyaya and program for its fulfilment to ensure satisfaction; Trust(Vishwas) and Respect as the foundational values of relationship -Understanding the meaning of Vishwas; Difference between intention and competence -Understanding the meaning of Samman, Difference between respect and differentiation; the other salient values in relationship -Understanding the harmony in the society (society being an extension of family)-Visualizing a universal harmonious order in society- Undivided Society (Akhand Samaj), Universal Order- from family to world family.

UNIT IV ENGINEERING ETHICS 9

Senses of ‗Engineering Ethics„ – Variety of moral issues – Types of inquiry – Moral dilemmas – Moral Autonomy – Kohlberg's theory – Gilligan's theory – Consensus and Controversy – Models of professional roles - Theories about right action – Self-interest – Customs and Religion – Uses of Ethical Theories.

UNIT V SAFETY, RESPONSIBILITY AND RIGHTS 9

Safety and Risk – Assessment of Safety and Risk – Risk Benefit Analysis and Reducing Risk - Respect for Authority – Collective Bargaining – Confidentiality – Conflicts of Interest – Occupational Crime – Professional Rights – Employee Rights – Intellectual Property Rights (IPR) – Discrimination-Moral Leadership –Code of Conduct – Corporate Social Responsibility.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

At the end of the course the students will be able to

CO1: Understand the need of value education.

CO2: Comprehend the difference between self and body.

CO3: Understand the need to exist as an unit of Family and society.

CO4: Understand Harmony at all levels.

CO5: Apply the values acquired in the professional front.

CO6: Identify appropriate technologies for ecofriendly production systems.

TEXT BOOKS:

1. Human Values and Professional Ethics by R R Gaur, R Sangal, G P Bagaria, Excel Books, New Delhi, 2010 3.
2. Mike W. Martin and Roland Schinzinger, ―Ethics in Engineering‖, Tata McGraw Hill, New Delhi, 2003.
3. Govindarajan M, Natarajan S, Senthil Kumar V. S, ―Engineering Ethics‖, Prentice Hall of India, New Delhi, 2004

REFERENCE BOOKS:

1. Jeevan Vidya: Ek Parichaya, A Nagaraj, Jeevan Vidya Prakashan, Amarkantak, 1999.
2. Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004.
3. The Story of Stuff (Book).
4. The Story of My Experiments with Truth - by Mohandas Karamchand Gandhi AICTE Model Curriculum in Humanities, Social Science and Management Courses (UG Engineering & Technology) 169 | Page .
5. Small is Beautiful - E. F Schumacher.
6. Slow is Beautiful - Cecile Andrews.
7. Economy of Permanence - J C Kumarappa 8. Bharat Mein Angreji Raj – Pandit Sunderlal.

8. Rediscovering India - by Dharampal.
9. Hind Swaraj or Indian Home Rule - by Mohandas K. Gandhi .
10. India Wins Freedom - Maulana Abdul Kalam Azad.
11. Vivekananda - Romain Rolland (English) 13. Gandhi - Romain Rolland (English).
12. Charles B. Fleddermann, ―Engineering Ethics‖, Pearson Prentice Hall, New Jersey, 2004.
13. Charles E. Harris, Michael S. Pritchard and Michael J. Rabins, ―Engineering Ethics – Concepts and Cases‖, Cengage Learning, 2009.

WEB SOURCES:

1. www.onlineethics.org
2. www.nspe.org
3. www.globalethics.org

COs	POs												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	-	-	-	-	-	3	3	3	3	3	-	-	-	-	3
2	-	-	-	-	-	3	3	3	3	3	-	-	-	-	3
3	-	-	-	-	-	3	3	3	3	3	-	-	-	-	3
4	-	-	-	-	-	3	3	3	3	3	-	-	-	-	3
5	-	-	-	-	-	3	3	3	3	3	-	-	-	-	3
6	-	-	-	-	-	3	3	3	3	3	-	-	-	-	3
Overall correlation	-	-	-	-	-	3	3	3	3	3	-	-	-	-	3

23ME312	**FLUID MECHANICS AND HYDRAULIC MACHINERY**	**L**	**T**	**P**	**C**
		3	**0**	**2**	**4**

COURSE OBJECTIVES:

- Study about the properties of the fluids and behavior of fluids under static conditions.
- Gain basic knowledge of the dynamics of fluids and boundary layer concepts.
- Study the applications of the conservation laws to flow measurements, flow through pipes and forces on pipe bends.
- Learn the significance of boundary layer theory and its thicknesses.
- Study the basic principles of working and design of Pelton wheel, Francis and Kaplan turbine.
- Acquire knowledge on working principles of centrifugal, reciprocating and rotary pumps.

UNIT I FLUID PROPERTIES AND FLOW CHARACTERISTICS 9

Fluid Definition and Classification – Properties of fluids, Fluid statics - Pressure Measurements - Buoyancy and floatation - forces on submerged bodies, stability of floating bodies, Flow characteristics - Concept of control volume and system – Velocity potential and stream functions, Continuity equation, energy equation and momentum equation - Applications.

UNIT II FLOW THROUGH PIPES AND BOUNDARY LAYER 9

Reynold's Experiment - Laminar flow through circular conduits - Darcy Weisbach equation - friction factor - Moody diagram - Major and minor losses - Hydraulic and energy gradient lines - Pipes in series and parallel - Boundary layer concepts - Types of boundary layer thickness.

UNIT III DIMENSIONAL ANALYSIS AND MODEL STUDIES 9

Fundamental dimensions - Dimensional homogeneity - Rayleigh's method and Buckingham Pi theorem - Dimensionless parameters - Similitude and model studies - Distorted and undistorted models.

UNIT IV TURBINES 9

Impact of jets - Velocity triangles - Theory of rotodynamic machines - Classification of turbines - Working principles - Pelton wheel - Modern Francis turbine - Kaplan turbine - Work done - Efficiencies - Draft tube - Specific speed - Performance curves for turbines - Governing of turbines.

UNIT V PUMPS 9

Classification of pumps - Centrifugal pumps - Working principle - Heads and efficiencies– Velocity triangles - Work done by the impeller - Performance curves - Reciprocating pump working principle - Indicator diagram and it's variations - Work saved by fitting air vessels - Rotary pumps.

TOTAL: 45 PERIODS

LIST OF EXPERIMENTS **TOTAL : 30 PERIOD**

1. Determination of coefficient of discharge of a venturimeter.
2. Determination of coefficient of discharge of an orificemeter.
3. Determination of friction factor for flow through pipes.
4. Determination of metacentric height.
5. Characteristics of centrifugal pumps.
6. Characteristics of reciprocating pump.
7. Characteristics of gear pump.
8. Characteristics of Pelton wheel turbine.
9. Rotameter.
10. Characteristics of Francis wheel turbine.

COURSE OUTCOMES:

At the end of the course the students will be able to

CO1: Apply the conservation laws applicable to fluids and its application through fluid kinematics and dynamics and also to understand the properties and behavior of fluids in static conditions.

CO2: Estimate the losses in pipelines for both laminar and turbulent conditions and analysis of pipes connected in series and parallel.

CO3: Apply the concept of boundary layer and its thickness on the flat solid surface.

CO4: Formulate the relationship among the parameters involved in the given fluid phenomenon and to predict the performances of prototype by model studies.

CO5: Design the various types of turbines and to explain its working principles.

CO6: Design the various types of pumps and to explain its working principles.

TEXT BOOKS:

1. Modi P.N. and Seth, S.M. Hydraulics and Fluid Mechanics, Standard Book House, New Delhi, 22nd edition (2019).
2. R K Bansal, A Text Book of Fluid Mechanics and Hydraulic Machines, Laxmi Publications, New Delhi.

REFERENCE BOOKS:

1. Streeter, V. L. and Wylie E. B., Fluid Mechanics, McGraw Hill Publishing Co., 2010.
2. Cengel Y A and Cimbala J M, Fluid Mechanics, McGraw Hill Education Pvt. Ltd., 2014.
3. S K Som; Gautam Biswas and S Chakraborty, Introduction to Fluid Mechanics and Fluid Machines, Tata McGraw Hill Education Pvt. Ltd., 2012.

COs	POs												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	3	3	2	2	1	2	2	1	2	1	1	1	3	2	2
2	3	3	2	2	1	2	2	1	2	1	1	1	3	2	2
3	3	3	2	2	1	2	2	1	2	1	1	1	3	2	2
4	3	3	2	2	1	2	2	1	2	1	1	1	3	2	2
5	3	3	2	2	1	2	2	1	2	1	1	1	3	2	2
6	3	3	2	2	1	2	2	1	2	1	1	1	3	2	2
Overall Correlation	3	3	2	2	1	2	2	1	2	1	1	1	3	2	2

23AE311 AERO ENGINEERING THERMODYNAMICS

	L	T	P	C
	3	0	2	4

COURSE OBJECTIVES:

- To understand the basic concepts of thermodynamics systems and the application offirst law of thermodynamics to open and closed systems.
- To understand the concept of second law of thermodynamics and entropy.
- To derive fundamental relations between thermodynamic properties.
- To comprehend the operational principles of piston engines and jet engines, as wellas their air standard cycles.
- To understand the behavior of pure substances and its application to produce power.
- To understand the basic of heat transfer and the application on real time problem.

UNIT I FUNDAMENTAL CONCEPT AND FIRST LAW 9

Concept of continuum, macroscopic approach, thermodynamic systems – closed, open and isolated. Property, state, path and process, quasi-static process, work, internal energy, enthalpy, specific heat capacities and heat transfer, Zeroth law of thermodynamics, First law of thermodynamics, relation between pressure, volume and temperature for various processes, SFEE, application of SFEE to jet engine components.

UNIT II SECOND - LAW AND ENTROPY 9

Second law of thermodynamics – Equivalence between Kelvin Planck and Clausius statements. Reversibility and Irreversibility, Thermal reservoir, Carnot theorem. Carnotcycle, Reversed Carnot cycle, efficiency, COP, Thermodynamic temperature scale - Clausius inequality, Concept of entropy, Entropy changes for various processes.

UNIT III AIR STANDARD CYCLES 9

Otto, Diesel, Dual and Brayton cycles – - Air standard efficiency – Mean effective pressure.

UNIT IV FUNDAMENTALS OF VAPOUR POWER CYCLES 9

Properties of pure substances – solid, liquid and vapour phases, phase rule, p-v, p-T, T- v, T-s, h-s diagrams, p-v-T surfaces, thermodynamic properties of steam - standard Rankine cycle, Reheat and Regeneration cycle. Heat rate, Specific steam consumption, Tonne of refrigeration.

UNIT V BASICS OF PROPULSION AND HEAT TRANSFER 9

Classification of jet engines - basic jet propulsion arrangement – Engine station number,thrust equation – Specific thrust, SFC, TSFC, specific impulse, conduction in parallel, radial and composite wall, Basics of convective and radiation heat transfer.

TOTAL: 45 PERIODS

LIST OF EXPERIMENTS **TOTAL : 30 PERIOD**

1. Draw the Valve timing diagram of 4-Stroke engine and the Port timing diagram of 2-Stroke engine.
2. Performance test on a 4-Stroke diesel engine.
3. Determination of specific heat of solid by Bomb calorimeter.
4. Determine the COP of a Refrigeration System.
5. Determine the COP of an Air-conditioning System.
6. Determination of effectiveness of a parallel flow and counter flow heat exchangerand calculate the overall heat transfer coefficient (u) in the parallel flow heat exchanger.
7. Determination of effectiveness of a counter flow heat exchanger and calculate theoverall heat transfer coefficient (u) in the counter flow heat exchanger.
8. Determination of convective heat transfer coefficient during free and forced convection.
9. Determination of thermal conductivity of a metal.
10. Determination of thermal conductivity of a composite wall.

COURSE OUTCOMES:

At the end of the course the students will be able to

CO1: Apply first law of thermodynamics to solve problems related to open and closedsystems

CO2: Apply the second law of thermodynamics to Engineering devices.

CO3: Estimate the efficiency and performance of various air standard cycles

CO4: Determine efficiency and performance of vapor power cycle.

CO5: Calculate thermodynamics problems related to conduction, convention and radiation

CO6: Determine the jet engine performance by applying thermodynamics properties.

TEXT BOOKS:

1. Nag. P. K., “Engineering Thermodynamics”, 6th Edition, Tata McGraw-Hill,New Delhi, 2017.
2. Cengel, Y, M. Boles and M. Kanoğlu, Thermodynamics - An Engineering Approach, Tata McGraw Hill, 8thEdition, 2015.
3. Holman.J.P., “Thermodynamics”, 3rd Edition, McGraw-Hill, 2007

REFERENCE BOOKS:

1. Rathakrishnan E., “Fundamentals of Engineering Thermodynamics”, 2nd Edition, Prentice-Hall India, 2011
2. Arora C.P, “Thermodynamics”, Tata McGraw-Hill, New Delhi, 2017.
3. R.K.Rajput, “A text book of Engineering Thermodynamics”, Fifth Edition, Lakshmi Publications, New Delhi, 2016.
4. Merala C, Pother, Craig W, Somerton, “Thermodynamics for Engineers”, Schaum Outline Series,Tata McGraw-Hill, New Delhi, 2004.

COs	POs												PSOs		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
1	3	2	2	1	1	-	1	-	-	-	1	2	3	1	-
2	3	2	2	1	1	1	1	-	-	-	1		3	2	1
3	3	2	2	1	1	1	1	1	-	1	-	2	3	2	-
4	3	2	2	1	1	-	-	-	-	-	1	1	3	1	-
5	3	3	3	2	2	-	1	-	-	-	1	2	3	1	-
6	3	2	2	1	1	1	1	-	-	1	1	2	3	3	1
Overall correlation	3	3	3	2	2	1	1	1	-	1	1	2	3	2	1

23AE321 STRENGTH OF MATERIALS LABORATORY

L	T	P	C
0	0	4	2

COURSE OBJECTIVES:

- To determine experimental data, include universal testing machines and torsionequipment.
- To understand experimental data for spring testing machine, compression testingmachine, impact tester, hardness tester.
- To study stress analysis and design of beams subjected to bending and shearing loadsusing several methods.
- To make use of Flexural strength of a beam.
- To understand experimental stress with compression tests.

LIST OF EXPERIMENTS

1. Tension test on a mild steel rod & Plastics.
2. Compression on UTM.
3. Double shear test
   - Mild steel rods
   - Aluminum rods.
4. Torsion test on mild steel rod.
5. Impact test on metal & Composite specimen.
   - Charpy Test.
   - Izod Test.
6. Hardness test on metals
   - Brinell Hardness Number.
   - Rockwell Hardness Number.
7. Deflection test on beams
   - Cantilever Hardness Number.
   - Simply supported beams.
8. Compression test on helical springs.
   - Open coil Spring.
   - Closed coil spring.
9. Effect of hardening- Improvement in hardness.
10. Microscopic Examination of Hardened samples and Tempered samples.

COURSE OUTCOMES:

At the end of the course the students will be able to

CO 1: Analyse and design structural members subjected to tension, compression, torsion, bending and combined stresses using the fundamental concepts of stress, strain and elastic behaviour of materials.

CO 2: Examine the basic concepts of stress, strain, deformation, and material behavior under different types of loading (axial, torsion, bending).

CO 3: Examine stress analysis, design of beams subjected to bending and shearing loads using several methods.

CO 4: Examine the stresses and strains in axially loaded members subject to flexural loadings.

CO 5: Inspect the compression strength of the cast iron and steel.

CO 6: Analyse the changes that occur during the hardening of the material

COs	POs												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	3	3	2	2	2	2	2	2	3	1	-	1	2	-	-
2	3	3	2	2	2	2	2	2	3	1	-	1	3	-	-
3	3	3	2	2	2	2	2	2	3	1	-	1	3	-	-
4	3	3	2	2	2	2	2	2	3	1	-	1	3	-	-
5	3	3	2	2	2	2	2	2	3	1	-	1	3	-	-
6	3	3	2	2	2	2	2	2	3	1	-	1	3	-	-
Overall correlation	3	3	2	2	2	2	2	2	3	1	-	1	3	-	-

23ES391 PRESENTATION SKILLS

L	T	P	C
0	0	2	1*

COURSE OBJECTIVES:

- To help learners use brainstorming techniques for generating, organizing and outlining ideas.
- To familiarize learners with different speech structures by engaging them in watching speeches with great opening and closing.
- To give practice on voice modulation and use of body language and eye contact for making captivating presentations.
- To give hands on training on preparing presentation slides and using remote presentation tools.
- To train students on responding to question and feedback with confidence.

UNIT I BRAINSTORMING AND OUTLINING 6

Mind Mapping based on prior knowledge, collecting additional information from external resources, giving prompts to Generative AI tools seeking information, organizing ideas generated, knowing your audience.

UNIT II STRUCTURING THE PRESENTATION 6

3 Ts of a presentation, writing effective introduction- Beginning the introduction with a hook (question, data, storytelling) and closing the introduction with the objective of the presentation. Structuring the body paragraphs -Choosing key ideas from the list of ideas generated during brainstorming. Substantiating ideas with examples, data, reasons and anecdotes. Summarizing the ideas for conclusion.

UNIT III DELIVERY TECHNIQUES 6

Vocal variety, intonation, reducing filler words and improving articulation, inflection, engaging the audience. Body language- eye contact, gestures, movement on stage.

UNIT IV USE OF TECHNOLOGICAL AIDS 6

Use of presentation software like MS Power Point, Google Slides etc, incorporating images, graphs, charts and videos, using interactive tools like quizzes and polls, using remote presentation tools like zoom, MS Teams, WebEx for screen sharing, virtual whiteboards and chat functionalities, incorporating AR/VR for more immersive presentations .

UNIT V HANDLING QUESTIONS AND FEEDBACK 6

Audience engagement through questions, PAR (Point, Answer, Redirect) strategy for structuring responses to questions. Understanding feedback process - Receiving, interpreting and evaluating constructively, active listening techniques for processing feedback, responding to feedback- acknowledging, clarifying and appreciating, Dealing with challenging feedback.

TOTAL: 30 PERIODS

COURSE OUTCOMES:

After completion of the course, the students should be able to

CO1 construct ideas for presentation through mind mapping techniques.

CO2 organize ideas and structure the presentation with captivating introduction, body paragraphs illustrated with examples and reasons and compelling conclusion.

CO3 apply vocal variety and body language techniques to enhance delivery.

CO4 prepare engaging presentations by integrating multimedia elements.

CO5 demonstrate proficiency in delivering presentations in remote platforms utilizing various technological tools and strategies to engage audience in virtual environments.

CO6 exhibit active listening skills by responding to questions with clarity and confidence and incorporating constructive feedback for professional development.

TEXT BOOKS:

1. "Slide:ology: The Art and Science of Creating Great Presentations" by Nancy Duarte. O'Reilly Media
2. "The Naked Presenter: Delivering Powerful Presentations With or Without Slides" by Garr Reynolds. New Riders

REFERENCE BOOK:

Talk Like TED: The 9 Public-Speaking Secrets of the World's Top Minds" by Carmine Gallo.

23MA403	NUMERICAL AND STATISTICAL METHODS	L	T	P	C
		3	1	0	4

COURSE OBJECTIVES:

- provide the necessary basic concepts of a few statistical and numerical methods and give procedures for solving numerically different kinds of problems occurring in engineering and technology.
- acquaint the knowledge of testing of hypothesis for small and large samples which plays an important role in real life problems.
- introduce the basic concepts of solving algebraic and transcendental equations.
- introduce the numerical techniques of interpolation in various intervals and numerical techniques of differentiation and integration which plays an importantrole in engineering and technology.
- acquaint the knowledge of various techniques and methods of solving ordinary differential equations.

UNIT I TESTING OF HYPOTHESIS 9+3

Sampling distributions – Standard error - Large sample test for single mean, proportion, difference of means – Small sample Tests– t Test for single mean and difference of means - F test for equality of variance – Chi square test for single variance- Independence of attribute-Goodness of fit (Binomial Distribution, PoissonDistribution).

UNIT II DESIGN OF EXPERIMENTS 9+3

One way and two way classifications - Completely randomized design – Randomized block design – Latin square design.

UNIT III SOLUTION OF EQUATIONS AND EIGENVALUE PROBLEMS 9+3

Solution of algebraic and transcendental equations - Fixed point iteration method – Newton Raphson method- Solution of linear system of equations - Gauss elimination method – Pivoting - Gauss Jordan method – Iterative methods of GaussJacobi and Gauss Seidel - Eigenvalues of a square matrix by Power method.

UNIT IV INTERPOLATION, NUMERICAL DIFFERENTIATION AND NUMERICAL INTEGRATION 9+3

Interpolation - Newton‘s forward and backward difference interpolation -Lagrange‘s and Newton‘s divided difference interpolations –– Approximation of derivative using interpolation polynomials – Numerical single integration and double integrations using Trapezoidal and Simpson‘s 1/3rules.

UNIT V NUMERICAL SOLUTION OF ORDINARY DIFFERENTIAL EQUATIONS **9+3**

Single step methods: Taylor‘s series method - Euler‘s method - Modified Euler‘s method - Fourth order Runge-Kutta method for solving first order differential equations - Multi step methods: Milne‘s and Adam‘s Bashforth method.

TOTAL: 60 PERIODS

COURSE OUTCOMES:

At the end of the course the students will be able to

CO1: Analyze the given data for large and small samples.

CO2: Analyze the problems involving design of experiments.

CO3: Determine numerical solutions for nonlinear (algebraic or transcendental) equations, large system of linear equations and Eigen value problem of a matrix, when analytical methods fail to give solution.

CO4: Distinguish the Newton‘s forward, backward, divided difference, Lagrange‘s in finding the intermediate values of the experimental data and solving the problems using numerical differentiation and integration.

CO5: Solve numerically, ordinary differential equations which is used to solve different kinds of problems occurring in engineering and technology.

TEXT BOOKS:

1. Grewal, B.S., and Grewal, J.S., "Numerical Methods in Engineering and Science", Khanna Publishers, 10th Edition, New Delhi, 2015.
2. Johnson, R.A., Miller, I and Freund J., ―Miller and Freund‘s Probability and Statistics for Engineers", Pearson Education, Asia, 8th Edition,2015.

REFERENCE BOOKS:

1. Dr.P.Sivaramakrishnadas, Dr. C.Vijayakumari, ―Statistics and Numerical Methods‖ Pearson Publications.
2. Burden, R.L and Faires,J.D,"Numerical Analysis‖, 9th Edition, Cengage Learning,2016.
3. Devore.J.L.‖Probability and Statistics for Engineering and the Sciences‖, Cengage Learning, NewDelhi, 8th Edition,2014.
4. Gerald.C.F. and Wheatley.P.O. "Applied Numerical Analysis‖ Pearson Education, Asia, New Delhi, 7th Edition, 2007.

Cos	POs												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	3	2	1	1	-	-	-	-	-	-	-	1	3	-	-
2	3	2	1	1	-	-	-	-	-	-	-	1	3	-	-
3	3	2	1	1	-	-	-	-	-	-	-	1	3	-	-
4	3	2	1	1	-	-	-	-	-	-	-	1	3	-	-
5	3	2	1	1	-	-	-	-	-	-	-	1	3	-	-
Overall correlation	3	2	1	1	-	-	-	-	-	-	-	1	3	-	-

23AS401 AERODYNAMICS

L	T	P	C
3	0	0	3

COURSE OBJECTIVES:

- To recall the governing equations of fluid mechanics.
- To familiarize the behaviour of airflow over bodies with particular emphasis onaerofoil sections in the incompressible and compressible flow regime.
- To develop the Navier- Stoke equations and its application
- To make the student understand the concept of vorticity, irrotationality, theory ofairfoil and wing sections.
- To illustrate the conformal transformation and to extend the wing theory.
- To compare the interactions of shocks and expansion waves in fluid flow.

UNIT I INTRODUCTION TO LOW-SPEED FLOW 9

Incompressible Bernoulli's equation – circulation and vorticity – Green's lemma and Stoke's theorem – barotropic flow – Kelvin's theorem.

UNIT II TWO-DIMENSIONAL FLOWS 9

Basic flows – Source, Sink, Free and Forced Vortex, Uniform, and Parallel Flow and their combinations – Pressure and velocity distributions on bodies with and without circulation in ideal and real fluid flows.

UNIT III CONFORMAL TRANSFORMATION 9

Kutta Joukowski's theorem – Joukowski transformation and its application to fluid flow problems – Schwartz-Christoffer transformation – Kutta condition – Blasius theorem.

UNIT IV AIRFOIL AND WING THEORY 9

Joukowski, Karman – Trefftz, Profiles – Thin aerofoil theory and its applications – Vortex line – Horse shoe vortex – Biot and Savart law – Lifting line theory and its limitations.

UNIT V INTRODUCTION TO BOUNDARY LAYER THEORY 9

Mach number and its importance in compressible flows – Equation of motion for compressible flow in 1D – Normal shock – Rankine - Hugoniot relations – oblique shock relations – strong, weak and detached shocks – isentropic flows – Prandtl - Meyer expansion and expansion fans.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

At the end of the course the students will be able to

CO1: Calculate the airspeed, static and dynamic pressure of the flow at any point using Continuity and Bernoulli equations.

CO2: Illustrate the effect of airflow on an aircraft and its components using the laws of physics and fundamental mathematical methods.

CO3: Solve lift generation problems using aerofoil theories.

CO4: Apply the conformal transformation and its application to fluid flow problems.

CO5: Examine the fluid flow characteristics over aerofoils, wings, and airplanes.

CO6: Examine the shock phenomenon and fluid waves.

TEXT BOOKS:

1. Anderson J. D., "Fundamentals of Aerodynamics", 5th Ed., McGraw-Hill, 2010.
2. Anderson J. D., "Modern Compressible Flow with Historical Perspective", TMH,3rd Ed., 2012.
3. Clancy L. J., "Aerodynamics", Reprint Ed., Himalayan Books, 2006.
4. E Rathakrishnan, "Theoretical Aerodynamics", John Wiley, NJ, 2013.

REFERENCE BOOKS:

1. Bertin, J. J. and Cummings, R. M., "Aerodynamics for Engineers", 6th Ed., PrenticeHall, 2013.
2. Drela, M., "Flight Vehicle Aerodynamics", MIT Press, 2014.
3. Houghton, E. L., Carpenter, P. W., Collicott, S. H., and Valentine, D. T.,"Aerodynamics for Engineering Students", 6th Ed., Butterworth-Heinemann, 2012.
4. Kuethe, A. M. and Chow, C. Y., "Foundations of Aerodynamics", 5th Ed., JohnWiley, 1998.
5. Milne Thomson, L.H., "Theoretical aerodynamics", Dover Publications, 2011.

COs	POs												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	3	2	1	1	1	-	-	-	-	1	1	1	3	2	-
2	3	2	1	1	2	-	-	-	-	1	1	1	3	2	-
3	3	3	2	-	2	-	-	-	-	1	1	2	3	1	-
4	3	2	1	1	2	-	-	-	-	1	1	1	3	1	-
5	3	2	1	1	2	-	-	-	-	1	1	1	3	2	-
6	3	3	2	-	2	1	1	2	-	1	1	2	1	2	2
Overall correlation	3	3	2	1	2	1	1	2	-	1	1	2	3	2	2

23AS402 AEROSPACE PROPULSION

L	T	P	C
3	0	0	3

COURSE OBJECTIVES:

- To understand the principles of operation of aircraft propulsion systems.
- To extend the performances of aircraft propulsion systems.
- To introduce the working of different types of compressors and solve complexproblems.
- To introduce the working of different types of turbines and solve complexproblems.
- To understand the combustion process in Jet Engines.
- To understand the basics of integral ram-rocket and its performance.

UNIT I SUBSONIC AND SUPERSONIC INTAKES 9

T-S diagram of turbojet engine-Performance of subsonic and supersonic intakes – Performance parameters – Sources of losses –Starting problem in supersonic intakes – Modes of operation of an external compression intake.

UNIT II CENTRIFUGAL AND AXIAL FLOW COMPRESSORS 9

Principle of operation – Work done and pressure rise – diffuser – Compressibility effects – nondimensional quantities for plotting compressor characteristics – Centrifugal compressor characteristics. Basic operation – Elementary theory – Factors affecting stage pressure ratio – Blockage in the compressor annulus – Degree of reaction – Three-dimensional flow – Calculation of stage performance – Compressibility effects – Axial compressor characteristics.

UNIT III AXIAL AND RADIAL FLOW TURBINES 9

Elementary theory of axial flow turbine – Vortex theory – Choice of blade profile, pitch and chord – Estimation of stage performance – Overall turbine performance – Turbine Blade Cooling– Radial flow turbine – Operating Principle – Velocity Diagram and Applications.

UNIT IV COMBUSTION CHAMBERS AND NOZZLES 9

Operational requirements – Types of combustion system – Gasturbine Combustors – Afterburners – Fuel injection in combustion chamber – Important factors combustor design – Combustion chamber performance – Aircraft fuels – Sustainable aviation and zero emission fuels- Exhaust Nozzles – Fixed and variable geometry nozzles – Functions of nozzles – Thrust vector control – Thrust reversal.

UNIT V RAMJET PROPULSION 9

Principle of operation of axial flow turbines– limitations of radial flow turbines- Work done and pressure rise – Velocity diagrams – degree of reaction – constant nozzle angle designs – performance parameters of axial flow turbine– turbine blade cooling methods– stage efficiency calculations – basic blade profile design considerations – matching ofcompressor and turbine.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

At the end of the course the students will be able to

CO1: Calculate the forces produced by aircraft propulsion systems using control volume and momentum equation.

CO2: Solve complex problems in compressors used in aircraft.

CO3: Solve complex problems in turbines used in aircraft.

CO4: Determine the phenomena which characterize the fluid dynamic behaviour of air-breathing propulsion systems.

CO5: Determine the approximate use parameters of an existing gas turbine engine.

CO6: Model ramjet operations, features, and problems associated with it.aircraft engine.

CO6: Outline the various functions of nozzle.

TEXT BOOKS:

1. Farokhi, S., "Air Craft Propulsion", Wiley, 2nd Ed., 2014.
2. Hill P. G., and Peterson C. R., "Mechanics and Thermodynamics of Propulsion", Pearson Education, 2nd Ed., 2009

REFERENCE BOOKS:

1. Mathur, M.L. and Sharma, R.P., "Gas Turbine, Jet and Rocket Propulsion",Standard Publishers & Distributors, Delhi, 2nd Ed., 2014.
2. Oates G. C., "Aerothermodynamics of Aircraft Engine Components", AIAA Education Series, 1985.
3. Rolls Royce, "The Jet Engine", Hand Book, Wiley – 5th Ed., 2015.
4. Saravanamuttoo, H.I.H., Rogers, and G.F.C., Cohen, H., "Gas Turbine Theory", Pearson, 7th Ed., 2017.
5. Rathakrishanan E "Applied Gas Dynamics" Wiley – 2nd Ed,2019.

COs	POs												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	3	2	1	-	-	-	-	-	-	-	-	-	2	-	-
2	3	2	1	-	-	-	-	-	-	-	-	-	3	-	-
3	3	2	1	-	-	-	-	-	-	-	-	-	3	-	-
4	3	2	1	-	-	-	-	-	-	-	-	-	3	-	-
5	3	2	1	-	-	-	-	-	-	-	-	-	3	-	-
Overall correlation	3	2	1	-	-	-	-	-	-	-	-	-	3	-	-

23AS403 AEROSPACE STRUCTURAL MECHANICS

L	T	P	C
3	0	0	3

COURSE OBJECTIVES:

- To provide the students an understanding on the linear static analysis of determinate and indeterminate aircraft structural components.
- To provide the students an understanding on energy methods to statically determinate and indeterminate structures.
- To make the students to create a structure to carry the given load.
- To make the students to Calculate the response of statically indeterminate structures under various loading conditions.
- To provide the design process using different failure theories.

UNIT I UNSYMMETRICAL BENDING 9

Bending stresses in beams of unsymmetrical sections (K-method, Neutral axis method and Principal axis Method) – Bending of symmetric sections with skew loads.

UNIT II STATICALLY DETERMINATE & INDETERMINATE STRUCTURE 9

Plane truss analysis – method of joints – method of sections – method of shear – 3-D trusses – Clapeyron's 3 - moment equation and moment distribution method for indeterminate beams.

UNIT III ENERGY METHODS 9

Strain Energy in axial, bending, torsion and shear loadings. Castigliano's theorems and their applications. Energy methods applied to statically determinate and indeterminate beams, frames, rings & trusses.

UNIT IV SHEAR FLOW IN OPEN & CLOSED SECTIONS 9

Thin-walled beams, Concept of shear flow, Shear center, Elastic axis, with one axis of symmetry with effective and ineffective wall in bending, Bredt-Batho formula, Shear flow in single and multi -cell structures under torsion and bending with effective and ineffective wall, Box Beams.

UNIT V BUCKLING OF COLUMNS, PLATES & THIN-WALLED BEAMS 9

Euler's column curve – inelastic buckling – effect of initial curvature – Southwell plot – columns with eccentricity - Buckling of thin plates, Inelastic buckling of plates, Local instability, Instability of stiffened panels, Failure stress in plates and stiffened panels, Crippling stresses by Needham's and Gerard's methods.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

At the end of the course the students will be able to

CO1: Identify stress and strain transformation on different plane for combined loading.

CO2: Analysze and design various riveted and welded joints.

CO3: Evaluate the bending stresses and flexural shear flows in thin-walled sections.

CO4: Obtain critical loads for columns with different end conditions.

CO5: Apply the theories of failure in designing the structures.

CO6: Illustrate the concepts of buckling for thin-walled sections.

TEXT BOOKS:

1. James M. Gere & Barry J Goodno, " Mechanics of Materials ", Cengage Learning Custom Publishing; 8th edition, 2012.
2. Megson T M G, `Aircraft Structures for Engineering students' Butterworth-Heinemann publisher, 5th edition.

REFERENCE BOOKS:

1. Bruhn E F, 'Analysis and Design of Flight Vehicle Structures', Tri-State Off-set Company, USA, 1985.
2. Donaldson, B.K., 'Analysis of Aircraft Structures - An Introduction' Cambridge University Press publishers, 2 nd edition, 2008.
3. Peery, D.J., and Azar, J.J., Aircraft Structures, 2nd edition, McGraw – Hill, N.Y.,1999.
4. N.C. Pandya, C.S. Shah, "Elements of Machine Design", Charotar Publishing House, 15th edition, 2009.

23AS421 LOW- AND HIGH-SPEED AERODYNAMICS LABORATORY

L	T	P	C
0	0	4	2

COURSE OBJECTIVES:

- To study experimentally the aerodynamic forces on different bodies at low - and high- speeds.
- To predict different aerodynamic used in aero application.
- To study airfoil and wing characteristics.

LIST OF EXPERIMENTS :

1. Calibration of subsonic wind tunnel.
2. Illustrate the Pressure distribution over smooth and rough cylinder.
3. Illustrate the Pressure distribution over symmetric airfoils.
4. Illustrate the Pressure distribution over cambered airfoils & thin airfoils.
5. Measure the forces acting on a model using wind tunnel balance.
6. Force measurement and flow visualization of VTOL model at low speeds.
7. Demonstrate the flow over a flat plate at different angles of incidence.
8. Show the flow visualization studies in low speed flows over cylinders.
9. Show the flow visualization studies in low speed flows over airfoil with different angle of incidence.
10. Calibration of supersonic wind tunnel.
11. Show the Supersonic flow visualization with Schlieren system.

TOTAL : 30 PERIODS

COURSE OUTCOMES:

At the end of the course the students will be able to

CO1: Experiment with the wind tunnel for wall effect, blockage and support interference on the measurements as well as determining the uncertainty in the measurement technique.

CO2: Determine the pressure distribution and forces acting over aerodynamical models.

CO3: Explain flow over the aerodynamical model through flow visualization.

CO4: Illustrate the limits and usefulness of the experimental approach.

CO5: Demonstrate the experimental findings in clear oral and concise report.

CO6: Illustrate the limits and usefulness of the experimental approach on comparingwith theoretical approach.

COs	POs												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	3	3	3	2	2	1	1	2	3	3	2	2	3	2	2
2	3	3	3	1	2	1	1	2	3	3	2	2	3	2	2
3	3	3	2	2	2	1	1	1	3	3	1	1	3	2	2
4	3	3	2	1	1	1	2	2	3	3	2	1	3	2	2
5	3	3	2	1	1	1	1	2	2	2	2	2	3	1	2
6	3	3	2	1	1	1	1	2	2	2	2	2	3	1	2
Overall correlation	3	3	2	1	1	1	1	2	3	3	2	2	3	2	2

23AS422 AEROSPACE STRUCTURES LABORATORY

L	T	P	C
0	0	4	2

COURSE OBJECTIVES:

- To experimentally study the unsymmetrical bending of beams,
- To find the location of shear centre.
- To obtain the stresses in circular discs and beams using photo elastic techniques.
- To calibration of photo-elastic materials and study on vibration of beams.

LIST OF EXPERIMENTS :

1. Unsymmetrical bending of beams.
2. Find the shear centre location for open sections.
3. Find the shear centre location for closed sections.
4. Experiment the constant strength beam.
5. Draw the flexibility matrix for cantilever beam.
6. Beam with combined loading.
7. Calibration of Photo-elastic materials.
8. Stresses in circular discs and beams using photo-elastic techniques.
9. Vibrations of beams.
10. Experiment with the Wagner beam – Tension field beam.
11. Buckling load for column- Various end conditions.

TOTAL : 30 PERIODS

COURSE OUTCOMES:

At the end of the course the students will be able to

CO1 : Evaluate the effects of bending in the aerospace structures.

CO2 : Explain the shear centre of the aerospace structures.

CO3 : Compare the photo-elastic techniques on the aerospace structures.

CO4 : Justify the experimental findings in clear oral and concise report.

CO5: Analyze the columns at various end conditions.

CO6: Analyze the vibrations of cantilever beam.

COs	POs												PSCOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	3	2	1	1	1	-	-	-	-	-	-	-	2	2	-
2	3	2	1	2	1	-	-	-	-	-	-	-	3	2	-
3	3	2	1	2	2	-	-	-	-	-	-	-	3	2	-
4	3	2	1	1	1	-	-	-	-	-	-	-	2	2	-
5	3	2	1	2	1	-	-	-	-	-	-	-	3	2	-
6	3	2	1	2	2	-	-	-	-	-	-	-	3	2	-
Overall correlation	3	2	1	2	2	-	-	-	-	-	-	-	3	2	-

23ES491 APTITUDE AND LOGICAL REASONING –I

	L	T	P	C
	0	0	2	1

COURSE OBJECTIVES:

- To improve the problem solving and logical thinking ability of the students.
- To acquaint student with frequently asked questions and patterns in quantitative aptitude and logical reasoning.

UNIT I **4**

Numbers, LCM, HCF, Averages, Ratio & Proportion, Mixtures & Allegation.

UNIT II **4**

Percentages, Time and work, Pipes and Cistern, coding and decoding.

UNIT III **4**

Time Speed Distance, Train, Boats and Streams, Analogy.

UNIT IV **4**

Data Interpretation(BAR,PIE,LINE), Seating arrangement.

UNIT V **4**

Simple Interest and Compound Interest, Profit loss and Discount, Partnership.

TOTAL: 20 PERIODS

COURSE OUTCOMES:

At the end of the course the students will be able to

CO 1 Understand the basic concepts of quantitative ability.

CO 2 Understand the basic concepts of logical reasoning skills.

CO 3 Increase in critical thinking skills.

CO 4 Able to solve campus placements aptitude papers covering Quantitative Ability, Logical Reasoning Ability.

TEXT BOOK:

APTIPEDIA, 2nd edition, Wiley Publishers.

REFERENCE BOOKS:

1. Quantitative Aptitude – R.S. Agarwal.
2. A Modern Approach To Verbal & Non-Verbal Reasoning By R S Agarwal.

KCG COLLEGE OF TECHNOLOGY (AUTONOMOUS)
REGULATIONS 2023
B. Tech ARTIFICIAL INTELLIGENCE AND DATA SCIENCE
CHOICE BASED CREDIT SYSTEM
CURRICULA FOR SEMESTERS I TO VIII

SEMESTER – I

SL. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
	23IP101	Induction Programme		-	-	-	-	-
THEORY								
1	23HS101	Essential Communication	HSMC	3	0	0	3	3
2	23MA101	Matrices and Calculus	BSC	3	0	0	3	3
3	23AD101	Programming in Python	ESC	3	0	0	3	3
4	23HS102	Heritage of Tamils	HSMC	1	0	0	1	1
THEORY AND PRACTICALS								
5	23PH111	Engineering Physics	BSC	3	0	2	5	4
6	23CY111	Engineering Chemistry	BSC	3	0	2	5	4
PRACTICALS								
7	23AD121	Python Programming Laboratory	ESC	0	0	4	4	2
8	23HS121	Communication skills Laboratory	HSMC	0	0	2	2	1
9	23HS122	General Clubs/Technical Clubs/NCC/NSS/Extension Activities	HSMC	0	0	2	2	1*
TOTAL				16	0	12	28	21

SEMESTER – II

SL. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
THEORY								
1	23HS201/ 23HS202	Professional English /Foreign Language	HSMC	3	0	0	3	3
2	23MA202	Discrete Mathematics	BSC	3	1	0	4	4
3	23PH205	Physics for Information Science	BSC	3	0	0	3	3
4	23AD201	C and Data Structures	PCC	3	0	0	3	3
5	23HS203	Tamils and Technology	HSMC	1	0	0	1	1
THEORY AND PRACTICALS								
6	23EE281	Basic Electrical and Electronics Engineering	ESC	2	0	2	4	3
7	23ME211	Engineering Graphics	ESC	3	0	2	5	4
PRACTICALS								
8	23ME221	Engineering Practices Laboratory	ESC	0	0	4	4	2
9	23AD221	C and Data Structures Laboratory	PCC	0	0	4	4	2
10	23ES291	Soft Skills	EEC	0	0	2	2	1*
TOTAL				18	1	14	33	25

SEMESTER – III

SL. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
THEORY								
1	23MA301	Linear Algebra	BSC	3	1	0	4	4
2	23CS302	Data Base Management System	PCC	3	0	0	3	3
3	23AD301	Object Oriented Programming in C++ and Java	PCC	3	0	0	3	3
4	23HS301	Universal Human Values and Ethics	HSMC	3	0	0	3	3
THEORY AND PRACTICALS								
5	23AD311	Fundamentals of Data Science	PCC	3	0	2	5	4
6	23CB311	Digital Principles and Computer Organization	ESC	3	0	2	5	4
PRACTICALS								
7	23CS322	Database Management System Laboratory	PCC	0	0	4	4	2
8	23AD322	Object Oriented Programming in C++ and Java Laboratory	PCC	0	0	4	4	2
9	23ES391	Presentation Skills	EEC	0	0	2	2	1*
TOTAL				18	1	14	33	25

SEMESTER – IV

SL. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
THEORY								
1	23MA411	Mathematical Modeling for Data Science	BSC	2	0	2	4	4
2	23AD401	Design and Analysis of Algorithms	PCC	3	0	0	3	3
3	23CS401	Operating Systems	PCC	3	0	0	3	3
4	23AD402	Big Data Computing	PCC	3	0	0	3	3
5	23AD403	Data Warehousing and Data Mining	PCC	3	0	0	3	3
THEORY AND PRACTICALS								
6	23AD411	Fundamentals of Artificial Intelligence	PCC	3	0	2	5	4
PRACTICALS								
7	23CS421	Operating Systems Laboratory	PCC	0	0	4	4	2
8	23AD421	Big Data Computing Laboratory	PCC	0	0	4	4	2
9	23ES491	Aptitude and Logical Reasoning - 1	EEC	0	0	2	2	1*
10	23AD422	Mini Project – 1	EEC	0	0	2	2	1
TOTAL				17	0	16	33	25

SEMESTER – V

SL. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
THEORY								
1	23RE501	Research Methodology and Intellectual Property Rights	ESC	2	0	0	2	2
2	23AD501	Web Technologies	PCC	3	0	0	3	3
3		Department Elective 1	DEC	3	0	0	3	3
4		Department Elective 2	DEC	3	0	0	3	3
5		Non-Department Elective - 1 (Emerging Technology)	NEC	3	0	0	3	3
THEORY AND PRACTICALS								
6	23AD511	Machine Learning and Data Visualization	PCC	3	0	2	5	4
PRACTICALS								
7	23AD521	Web Technologies Laboratory	PCC	0	0	4	4	2
8	23AD522	Mini Project – 2 (Development + Testing)	EEC	0	0	4	4	2
9	23ES591	Aptitude and Logical Reasoning – 2	EEC	0	0	2	2	1*
TOTAL				17	0	12	29	2 2

SEMESTER VI

SL. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
THEORY								
1		Department Elective 3	DEC	3	0	0	3	3
2		Department Elective 4	DEC	3	0	0	3	3
3		Non-Department Elective - 2 (Management / Safety Courses)	NEC	3	0	0	3	3
THEORY AND PRACTICALS								
4	23CE611	Environmental Sciences and Engineering	ESC	3	0	2	4	4
5	23AD611	Deep Learning	PCC	3	0	2	5	4
6	23AD612	Natural Language Processing	PCC	3	0	2	5	4
PRACTICALS								
7	23AD621	Project Work - Phase 1	EEC	0	0	4	4	2
8	23AD622	Technical Training	EEC	0	0	2	2	1
9	23AD623	Technical Seminar – 1	ESC	0	0	2	2	1
TOTAL				18	0	14	31	25

SEMESTER – VII

SL. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
THEORY								
1		Non-Department Elective - 3 (Management Courses)	NEC	3	0	0	3	3
2		Department Elective 5	DEC	3	0	0	3	3
3		Department Elective 6	DEC	3	0	0	3	3
4	23AD701	Comprehension	EEC	2	0	0	2	2
THEORY AND PRACTICALS								
5	23AD711	Computer Vision	PCC	3	0	2	5	4
PRACTICALS								
6	23AD721	Project Work - Phase 2	EEC	0	0	6	6	3
7	23AD722	Technical Seminar - 2	ESC	0	0	4	4	2
TOTAL				14	0	12	26	20

SEMESTER – VIII

SL. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
PRACTICALS								
1	23AD821/ 23AD822	Internship / Capstone Project.	EEC	0	0	20	20	10
TOTAL				0	0	20	20	10

TOTAL CREDITS: 173

DEPARTMENT ELECTIVE COURSES

VERTICAL 1: Generic Core Computer Engineering

SL. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1	23AD031	Data Processing using Python	DEC	3	0	2	5	4
2	23AD032	Object oriented Analysis and Design	DEC	3	0	2	5	4
3	23AD033	Automata Theory and Compiler Design	DEC	3	0	2	5	4
4	23AD034	Software Engineering Principles	DEC	3	0	0	3	3
5	23AD035	Distributed Computing	DEC	3	0	0	3	3
6	23AD035	Software Testing and Automation	DEC	3	0	2	5	4
7	23AD037	Principles of Programming Languages	DEC	3	0	2	5	4
8	23AD038	Social and Information Networks	DEC	3	0	0	3	3

VERTICAL 2: Analytical Sciences

SL. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1	23AD039	Business Intelligence and Analytics	DEC	3	0	2	5	4
2	23AD040	Software Project Management	DEC	3	0	2	5	4
3	23AD041	Exploratory Data Analysis	DEC	3	0	2	5	4
4	23AD042	Healthcare Data Analytics	DEC	3	0	0	3	3
5	23AD043	Intelligent Robots	DEC	3	0	0	3	3
6	23AD044	Pattern Recognition	DEC	3	0	2	5	4
7	23AD045	Soft Computing	DEC	3	0	2	5	4
8	23AD046	Knowledge Representation in AI	DEC	3	0	0	3	3

VERTICAL 3: Full Stack Development

SL. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1	23CS031	Java Full Stack Development	DEC	3	0	2	5	4
2	23CS032	Mobile App Development	DEC	3	0	2	5	4
3	23CS033	UI and UX Design	DEC	3	0	2	5	4
4	23CS034	MERN Stack Web Development	DEC	3	0	2	5	4
5	23CS035	DevOps	DEC	3	0	2	5	4
6	23CS036	Cognitive Systems	DEC	3	0	0	3	3
7	23CS037	Advanced Java Programming	DEC	3	0	2	5	4
8	23CS038	Python Full Stack Development	DEC	3	0	0	3	3

VERTICAL 4: Computational Intelligence

SL. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1	23AD047	Robotic Process Automation	DEC	3	0	0	3	3
2	23CS044	AR VR Technology	DEC	3	0	2	5	4
3	23AD049	Ethics of AI	DEC	3	0	2	5	4
4	23AD050	Speech Processing	DEC	3	0	2	5	4
5	23AD051	Evolutionary Computation	DEC	3	0	0	3	3
6	23AD052	Video Analytics	DEC	3	0	0	3	3
7	23AD053	Predictive Analysis and IOT	DEC	3	0	0	3	3
8	23AD054	Information Retrieval Techniques	DEC	3	0	2	5	4

VERTICAL 5: Cyber Security and Cloud Data Storage

SL. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1	23AD055	Web Application Security	DEC	3	0	3	3	3
2	23AD056	AI for Cyber Security	DEC	3	0	3	3	3
3	23AD057	Cyber Threat Intelligence	DEC	3	0	3	3	3
4	23AD058	Information Security Analysis and Audit	DEC	3	0	3	3	3
5	23AD059	Cloud Databases	DEC	3	0	3	3	3
6	23CB031	Ethical Hacking	DEC	3	0	3	3	3
7	23AD060	Steganography and Digital Watermarking	DEC	3	0	3	3	3
8	23AD061	Network Security and Cryptography	DEC	3	0	3	3	3

NON-DEPARMENT ELECTIVE

EMERGING TECHNOLOGY

SL NO	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1	23NE982	Resource Management Techniques	NEC	3	0	0	3	3
2	23NE983	Aviation Management	NEC	3	0	0	3	3
3	23NE986	Foundation of Robotics	NEC	3	0	0	3	3
4	23NE987	Space Engineering	NEC	3	0	0	3	3
5	23NE988	Electric and Hybrid Vehicles	NEC	3	0	0	3	3
6	23NE989	Wearable Devices	NEC	3	0	0	3	3

MANAGEMENT COURSES

SL NO	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1	23HS971	Total Quality Management	NEC	3	0	0	3	3
2	23HS972	Engineering Economics and Financial Accounting	NEC	3	0	0	3	3
3	23HS973	Engineering Management and Law	NEC	3	0	0	3	3
4	23HS974	Knowledge Management	NEC	3	0	0	3	3
5	23HS975	Industrial Management	NEC	3	0	0	3	3
6	23HS976	Entrepreneurship and Business Opportunities	NEC	3	0	0	3	3
7	23HS977	Modern Business Administration and Financing	NEC	3	0	0	3	3
8	23HS978	Essentials of Management	NEC	3	0	0	3	3

SAFETY COURSES

SL NO	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1	23HS979	Disaster Management	NEC	3	0	0	3	3
2	23HS980	Industrial Safety	NEC	3	0	0	3	3
3	23HS981	Automotive Safety	NEC	3	0	0	3	3

SEMESTER-WISE CREDIT DISTRIBUTION

SEMESTER	HSMC	BSC	ESC	PCC	DEC	NEC	EEC	Total
Semester I	5	11	5					21
Semester II	4	7	9	5				25
Semester III	3	4		18				25
Semester IV		4		20			1	25
Semester V			2	9	6	3	2	22
Semester VI			5	8	6	3	3	25
Semester VII			2	4	6	3	5	20
Semester VIII							10	10
Total – KCG curriculum	**12**	**26**	**23**	**64**	**18**	**9**	**21**	**173**

23MA301 LINEAR ALGEBRA

L	T	P	C
3	1	0	4

COURSE OBJECTIVES:

- To test the consistency and solve system of linear equations
- To find the basis and dimension of vector space
- To obtain the matrix of linear transformation and its eigenvalues and eigenvectors
- To find orthonormal basis of inner product space and find least square approximation
- To find eigenvalues of a matrix using numerical techniques and perform matrix decomposition.

UNIT I MATRICES AND SYSTEM OF LINEAR EQUATIONS 9+3

Matrices - Row echelon form - Rank - System of linear equations - Consistency - Gauss elimination method - Gauss Jordon method – Gauss Seidel Method

UNIT II VECTOR SPACES 9+3

Vector spaces - Subspace - Linear independence and dependence – Linear Span - Basis and dimension – Maximal Linearly Independent Subsets.

UNIT III LINEAR TRANSFORMATION 9+3

Linear transformation - Rank space and null space - Rank and nullity - Dimension theorem - Matrix representation of linear transformation - Eigenvalues and eigenvectors of linear transformation – Invertibility and Isomorphisms – Dual Spaces – Homogeneous Linear Differential Equations with Constant coefficients .

UNIT IV INNER PRODUCT SPACES 9+3

Inner product and norms - Properties - Orthogonal, Orthonormal vectors - Gram Schmidt orthonormalization process – Adjoint of Linear operator – Normal and self adjoint operators – Unitary and orthogonal operators and their Matrices

UNIT V EIGENVALUE PROBLEMS AND MATRIX DECOMPOSITION 9+3

Eigen value Problems - Power method, Jacobi rotation method - Singular value decomposition - QR decomposition – Generalized Inverse - Least square solution

TOTAL: 60 PERIODS

COURSE OUTCOMES:

At the end of the course the students will be able to

CO 1 Test the consistency and solve system of linear equations.

CO 2 Find the basis and dimension of vector space.

CO 3 Obtain the matrix of linear transformation and its eigenvalues and eigenvectors.
CO 4 Find orthonormal basis of inner product space and least square approximation.
CO 5 Find eigenvalues of a matrix using numerical techniques
CO 6 Perform Matrix Decomposition using different techniques

TEXT BOOKS:

1. Friedberg A.H, Insel A.J. and Spence L, "Linear Algebra", Prentice Hall of India, New Delhi, 2004.
2. Faires J.D. and Burden R., "Numerical Methods", Brooks/Cole (Thomson Publications), New Delhi, 2002.

REFERENCE BOOKS:

1. Kumaresan S, "Linear Algebra - A geometric approach", Prentice Hall of India, New Delhi, Reprint, 2010.
2. P.S.Das – "Numerical Analysis", Pearson Educations, New Delhi, 2002
3. Richard Branson, "Matrix Operations", Schaum's outline series, 1989.

COs	POs												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	3	2	2	-	-	-	-	-	-	-	-	-	-	-	2
2	3	2	2	-	-	-	-	-	-	-	-	-	-	-	2
3	3	2	2	-	-	-	-	-	-	-	-	-	-	-	2
4	3	2	2	-	-	-	-	-	-	-	-	-	-	-	2
5	3	2	2	-	-	-	-	-	-	-	-	-	-	-	2
6	3	2	2	-	-	-	-	-	-	-	-	-	-	-	2
Overall Correlation	3	2	2	-	-	-	-	-	-	-	-	-	-	-	2

23CS302 DATABASE MANAGEMENT SYSTEMS

	L	T	P	C
	3	0	0	3

COURSE OBJECTIVES:

- To learn the fundamentals of data models, conceptualize and depict a database system using ER diagram.
- To study the principles to be followed to create an effective relational database and write SQL queries to store/retrieve data to/from database systems.
- To know the fundamental concepts of transaction processing, concurrency control techniques and recovery procedure.
- To learn about the internal storage structures using different file and indexing techniques and the basics of query processing and optimization.
- To study the basics of distributed databases, semi-structured and un-structured data models.

UNIT I RELATIONAL DATABASES 9

Purpose of Database System – Views of Data – Data Models – Database System Architecture – Introduction to Relational Databases – Relational Model – Keys – Relational Algebra – Relational Calculus – SQL Fundamentals – Advanced SQL features – Triggers – Embedded SQL

UNIT II DATABASE DESIGN 9

Mapping Entity-Relationship Model – ER Diagrams – Functional Dependencies – Non-Loss Decomposition Functional Dependencies – First Normal Form – Second Normal Form – Third Normal Form – Dependency Preservation – Boyce/Codd Normal Form – Multi-Valued Dependencies and Fourth Normal Form – Join Dependencies and Fifth Normal Form.

UNIT III TRANSACTION MANAGEMENT 9

Transaction Concepts – ACID Properties – Serializability – Transaction Isolation Levels – Concurrency Control – Need for Concurrency – Lock-Based Protocols – Deadlock Handling -Recovery System – Failure Classification – Recovery Algorithm.

UNIT IV IMPLEMENTATION TECHNIQUES 9

Overview of Physical Storage Media – RAID – File Organization – Organization of Records in Files – Indexing and Hashing – Ordered Indices – B+ tree Index Files – Static Hashing – Dynamic Hashing – Query Processing Overview – Catalog Information for Cost Estimation – Query Optimization.

UNIT V NOSQL DATABASE 9

Overview of Distributed Databases – Data Fragmentation – Replication – NOSQL Database: Characteristics – CAP theorem – Outline of NOSQL Datastores: Column Oriented, Document, Key-Value and Graph Types – Applications – CRUD Operations.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

At the end of the course the

CO1: Explain the concepts of Database Management Systems and Apply SQL Queries Using relational Algebra

CO2: Apply conceptual modeling to real world applications and design database schemas

CO3: Demonstrate an understanding of normalization theory and apply such knowledge to the normalization of a database.

CO4: Explain the concepts of Transaction Processing and maintain consistency of the database.

CO5: Explain basic database storage structures, access techniques and query processing.

CO6: Describe distributed, semi-structured and unstructured database systems.

TEXT BOOKS:

1. Abraham Silberschatz, Henry F. Korth, S. Sudharshan,"Database System Concepts", Seventh Edition, Tata McGraw Hill, 2019.
2. Ramez Elmasri, Shamkant B. Navathe, "Fundamentals of Database Systems", Seventh Edition, Pearson Education, 2021.

REFERENCE BOOKS:

1. C. J. Date, A. Kannan, S. Swamynathan, "An Introduction to Database Systems", Eighth Edition, Pearson Education, 2006.
2. Raghu Ramakrishnan, Johannes Gehrke, "Database Management Systems", Fourth Edition, Tata McGraw Hill, 2010.
3. G. K. Gupta, "Database Management Systems", Tata McGraw Hill, 2011.
4. Carlos Coronel, Steven Morris, Peter Rob, "Design Implementation and Management", Ninth Edition, Cengage Learning, 2011.

COs	**POs**												**PSOs**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
1	2	2	3	2	1	-	-	-	2	1	1	2	2	1	-
2	3	1	3	1	1	-	-	-	2	1	1-	2	3	1	-
3	3	2	3	2	1	-	-	-	2	1	1	2	3	1	-
4	1	2	2	2	-	-	-	-	2	1	1	1	1	-	-
5	1	1	2	2	-	-	-	-	1	1	-	1	1	-	-
6	2	1	3	2	1	-	-	-	-	1	-	2	2	1	-
Overall Correlation	2	2	3	2	1	-	-	-	2	1	1	2	2	1	-

23AD301	**OBJECT ORIENTED PROGRAMMING IN C++ AND JAVA**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

COURSE OBJECTIVES:

- Understand the concepts of Object-oriented Programming and discuss the important elements of C++.
- To understand and apply the concepts of classes, Inheritance, and exception handling.
- To understand and apply the concepts of packages, interfaces, and Multithread.
- To develop applications using Event Driven Programming
- To develop applications using Swing Programming

UNIT I OBJECT ORIENTED PROGRAMMING AND C++ 12

Basic Concepts of Objects Oriented Programming - Operators - Control Structures Functions in C++ - Function Overloading - Class - Member Function - Nesting of Member function - Constructors - Destructors - Array with Class - Static Data Member - Friend functions - Returning Objects - Operator Overloading - Type Conversion - Basic type to Class – Class to Basic - Class to Class.

UNIT II OVERVIEW OF JAVA AND EXCEPTION HANDLING 9

An overview of Java, data types, variables and arrays, operators, control statements, classes, objects, methods – Inheritance. Exceptions – exception hierarchy – throwing and catching exceptions – built-in exceptions, creating own exceptions.

UNIT III JAVA PROGRAMMING 6

Packages and Interfaces, Multithreaded programming, Strings, Input /Output, Generic Programming – Generic classes – generic methods.

UNIT IV EVENT DRIVEN PROGRAMMING 9

Graphics programming – Frame – Components – working with 2D shapes – Using colour, fonts, and images – Basics of event handling – event handlers – adapter classes – actions – mouse events – AWT event hierarchy.

UNIT V JAVA PROGRAMMING USING SWING 9

Introduction to Swing – layout management – Swing Components – Text Fields, Text Areas – Buttons- Check Boxes – Radio Buttons – Lists- choices- Scrollbars – Windows – Menus – Dialog Boxes.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

At the end of the course the student will be able to

- Develop C++ programs using OOP principles.
- Develop Java programs with the concepts of inheritance and interfaces.
- Build Java applications using exceptions, threads and generics classes
- Develop Java applications with event driven program.
- Develop interactive Java programs using swings.

TEXT BOOKS:

1. K.R. Venugopal, Rajkumar Buyya, T.Ravishankar, “Mastering C++”, TMH, 2017 (Unit I)
2. Herbert Schildt, “The Java 2: Complete Reference”, Eighth Edition, TMH, 2018. (Unit II, Unit III, Unit IV, and Unit-V)

REFERENCE BOOK:

1. Ira Pohl, “Object oriented programming using C++”, Pearson Education Asia,2003
2. Bjarne Stroustrup, "The C++ programming language" Addison Wesley, 2000
3. John R.Hubbard, "Progranning with C++", Schaums outline series, TMH, 2003
4. H.M.Deitel, P.J.Deitel, "Java : how to program", Fifthe edition, Prentice Hall of India private limited.
5. E.Balagurusamy “ Object Oriented Programming with C++”, TMH 2/e

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COs	POs												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	3	2	3	-	2	-	-	-	-	-	-	2	3	-	-
2	3	3	3	-	2	-	-	-	-	-	-	2	3	-	-
3	3	3	3	-	2	-	-	-	-	-	-	2	3	-	-
4	3	2	2	-	2	-	-	-	-	-	-	2	3	-	-
5	3	3	3	-	3	-	-	-	-	-	-	2	3	-	-
6	3	3	3		3							3	3		
Overall correlation	**3**	**3**	**3**	**-**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**3**	**-**	**-**

23HS301	UNIVERSAL HUMAN VALUES AND ETHICS	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- Development of a holistic perspective based on self-exploration about themselves (human being), family, society and nature/existence.
- Understanding (or developing clarity) of the harmony in the human being, family, society and nature/existence.
- Strengthening of self-reflection.
- Development of commitment and courage to act.

UNIT I COURSE INTRODUCTION 9

Need, Basic Guidelines, Content and Process for Value Education - Understanding the need, basic guidelines, content and process for Value Education -Self Exploration–what is it? - its content and process; 'Natural Acceptance' and Experiential Validation- as the mechanism for self exploration - Continuous Happiness and Prosperity- A look at basic Human Aspirations -Right understanding, Relationship and Physical Facilities- the basic requirements for fulfilment of aspirations of every human being with their correct priority -Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario -Method to fulfil the above human aspirations: understanding and living in harmony at various levels.

UNIT II UNDERSTANDING HARMONY IN THE HUMAN BEING 9

Harmony in Myself- Understanding human being as a co-existence of the sentient 'I' and the material 'Body' -Understanding the needs of Self ('I') and 'Body' - Sukh and Suvidha- Understanding the Body as an instrument of 'I' (I being the doer, seer and enjoyer) - Understanding the characteristics and activities of 'I' and harmony in 'I' -Understanding the harmony of I with the Body: Sanyam and Swasthya; correct appraisal of Physical needs, meaning of Prosperity.

UNIT III UNDERSTANDING HARMONY IN THE FAMILY AND SOCIETY 9

Harmony in Human-Human Relationship -Understanding Harmony in the family – the basic unit of human interaction -Understanding values in human-human relationship; meaning of Nyaya and program for its fulfilment to ensure satisfaction; Trust(Vishwas) and Respect as the foundational values of relationship -Understanding the meaning of Vishwas; Difference between intention and competence -Understanding the meaning of Samman, Difference between respect and differentiation; the other salient values in relationship -Understanding the harmony in the society (society being an extension of family)-Visualizing a universal harmonious order in society- Undivided Society (Akhand Samaj), Universal Order- from family to world family.

UNIT IV ENGINEERING ETHICS **9**

Senses of ‗Engineering Ethics„ – Variety of moral issues – Types of inquiry – Moral dilemmas – Moral Autonomy – Kohlberg's theory – Gilligan's theory – Consensus and Controversy – Models of professional roles - Theories about right action – Self-interest – Customs and Religion – Uses of Ethical Theories.

UNIT V SAFETY, RESPONSIBILITY AND RIGHTS **9**

Safety and Risk – Assessment of Safety and Risk – Risk Benefit Analysis and Reducing Risk - Respect for Authority – Collective Bargaining – Confidentiality – Conflicts of Interest – Occupational Crime – Professional Rights – Employee Rights – Intellectual Property Rights (IPR) – Discrimination-Moral Leadership –Code of Conduct – Corporate Social Responsibility.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

At the end of the course the students will be able to

CO1: Understand the need of value education.

CO2: Comprehend the difference between self and body.

CO3: Understand the need to exist as an unit of Family and society.

CO4: Understand Harmony at all levels.

CO5: Apply the values acquired in the professional front.

CO6: Identify appropriate technologies for ecofriendly production systems.

TEXT BOOKS:

1. Human Values and Professional Ethics by R R Gaur, R Sangal, G P Bagaria, Excel Books, New Delhi, 2010 3.
2. Mike W. Martin and Roland Schinzinger, ―Ethics in Engineering‖, Tata McGraw Hill, New Delhi, 2003.
3. Govindarajan M, Natarajan S, Senthil Kumar V. S, ―Engineering Ethics‖, Prentice Hall of India, New Delhi, 2004

REFERENCE BOOKS:

1. Jeevan Vidya: Ek Parichaya, A Nagaraj, Jeevan Vidya Prakashan, Amarkantak, 1999.
2. Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004.
3. The Story of Stuff (Book).
4. The Story of My Experiments with Truth - by Mohandas Karamchand Gandhi AICTE Model Curriculum in Humanities, Social Science and Management Courses (UG Engineering & Technology) 169 | Page .
5. Small is Beautiful - E. F Schumacher.
6. Slow is Beautiful - Cecile Andrews.
7. Economy of Permanence - J C Kumarappa 8. Bharat Mein Angreji Raj – Pandit Sunderlal.

8. Rediscovering India - by Dharampal.
9. Hind Swaraj or Indian Home Rule - by Mohandas K. Gandhi .
10. India Wins Freedom - Maulana Abdul Kalam Azad.
11. Vivekananda - Romain Rolland (English) 13. Gandhi - Romain Rolland (English).
12. Charles B. Fleddermann, —Engineering Ethics‖, Pearson Prentice Hall, New Jersey, 2004.
13. Charles E. Harris, Michael S. Pritchard and Michael J. Rabins, —Engineering Ethics – Concepts and Cases‖, Cengage Learning, 2009.

WEB SOURCES:

1. www.onlineethics.org
2. www.nspe.org
3. www.globalethics.org

COs	POs												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	-	-	-	-	-	3	3	3	3	3	-	-	-	-	3
2	-	-	-	-	-	3	3	3	3	3	-	-	-	-	3
3	-	-	-	-	-	3	3	3	3	3	-	-	-	-	3
4	-	-	-	-	-	3	3	3	3	3	-	-	-	-	3
5	-	-	-	-	-	3	3	3	3	3	-	-	-	-	3
6	-	-	-	-	-	3	3	3	3	3	-	-	-	-	3
Overall correlation	-	-	-	-	-	3	3	3	3	3	-	-	-	-	3

23AD311 FUNDAMENTALS OF DATA SCIENCE

	L	T	P	C
	3	**0**	**2**	**4**

COURSE OBJECTIVES:

- To gain knowledge in the basic concepts of Data Science
- To acquire skills in data preparatory and pre-processing steps
- To learn the tools and packages in Python for data science
- To acquire knowledge in data interpretation and visualization techniques
- To understand the ethics for data science

UNIT I INTRODUCTION 9

Need for data science –benefits and uses –facets of data –data science process –setting the research goal –retrieving data –cleansing, integrating, and transforming data –exploratory data analysis –build the models –presenting and building applications.

UNIT II DATA HANDLING – PART I 9

Understanding Data Types in Python - Basics of Numpy arrays – Computation on NumPy Arrays: Universal Functions - Aggregations: Min, Max, and Everything in Between - Computation on Arrays: Broadcasting – Comparisons, Masks, and Boolean Logic –fancy indexing – Sorting Arrays - Structured Data.

UNIT III DATA HANDLING – PART II 9

Introducing Pandas Objects: Data manipulation with Pandas –data indexing and selection –operating on data –missing data –hierarchical indexing – Combining Datasets: Concat and Append - Merge and Join –aggregation and grouping –pivot tables - Working with Time Series.

UNIT IV DATA VISUALIZATION 9

Visualization with matplotlib –line plots –scatter plots –visualizing errors –density and contour plots –histograms, binnings, and density –three dimensional plotting –geographic data –data analysis using statmodels and seaborn –graph plotting using Plotly –interactive data visualization using Bokeh

UNIT V ETHICS AND DATA SCIENCE 9

Data Ownership, The Five Cs, Implementing the Five Cs, Ethics and Security Training, Developing Guiding Principles, Building Ethics into a Data-Driven Culture, Regulation, Building Our Future, Case Study

TOTAL: 45 PERIODS

PRACTICAL EXERCISES: 30 PERIODS

1. Install the data Analysis and Visualization tool: R/ Python
2. Perform exploratory data analysis (EDA) on with datasets like email data set. Export all your emails as a dataset, import them inside a pandas data frame, visualize them and get different insights from the data
3. Working with Numpy arrays, Pandas data frames, Basic plots using Matplotlib.

4. Explore various variable and row filters in R for cleaning data. Apply various plot features in R on sample data sets and visualize.
5. Perform Time Series Analysis and apply the various visualization techniques
6. Perform EDA on Wine Quality Data Set.
7. Use a case study on a data set and apply the various EDA and visualization techniques and present an analysis report.

COURSE OUTCOMES:

At the end of the course the students will be able to

- Apply the skills of data inspecting and cleansing.
- handle data using primary tools used for data science in Python
- Demonstrate the useful information using mathematical skills
- Apply the knowledge for data describing and visualization using tools.
- Learn to think through the ethics surrounding privacy, data sharing.

TOTAL: 45 + 30 = 75 PERIODS

TEXT BOOKS:

1. David Cielen, Arno D. B. Meysman, and Mohamed Ali, "Introducing Data Science", Manning Publications, 2016
2. Jake VanderPlas, "Python Data Science Handbook", O'Reilly, 2016.
3. Mike Loukides, Hilary Mason and D J Patil "Ethics and Data Science", O'Reilly, 1st edition, 2018.

REFERENCE BOOKS:

1. Allen B. Downey, "Think Stats: Exploratory Data Analysis in Python", Green Tea Press, 2014.

COs	POs												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	2	1	-	-	1	-	-	-	-	1	-	-	2	1	-
2	3	2	1	1	1	-	-	-	-	1	-	-	3	1	-
3	3	2	1	1	2	-	-	-	2	1	-	-	3	1	-
4	3	2	1	1	2	-	-	-	2	1	-	-	3	1	-
5	2	1	-	-	1	-	-	-	2	1	-	-	2	1	-
6	2	1	-	-	1	-	-	-	-	1	-	-	2	1	-
Overall correlation	3	2	1	1	2	-	-	-	2	2	-	-	3	2	-

23CB311 DIGITAL PRINCIPLES & COMPUTER ORGANIZATION

L	T	P	C
3	0	2	4

COURSE OBJECTIVES:

- To analyze and design combinational circuits.
- To analyze and design sequential circuits
- To learn the basic structure and operation of a digital computer.
- To study the design of data path unit, control unit for processor and hazards
- To learn the concept of various memories and I/O interfacing.

UNIT I COMBINATIONAL LOGIC 9

Combinational Circuits – Karnaugh Map – Half and full Adder – Subtractors – Binary parallel adder - Magnitude Comparator – Decoder – Encoder – Multiplexers – Demultiplexers, Code converters

UNIT II SYNCHRONOUS SEQUENTIAL LOGIC 9

Flip-Flops – operation and excitation tables, Triggering of FF, Analysis and design of clocked sequential circuits – Design – Moore/Mealy models, state minimization, state assignment, - Registers – Counters- Ripple counters

UNIT III COMPUTER FUNDAMENTALS 9

Functional Units of a Digital Computer: Von Neumann Architecture – Operation and Operands of Computer Hardware Instruction – Instruction Set Architecture (ISA):– Instruction and Instruction Sequencing – Addressing Modes, Encoding of Machine Instruction – Interaction between Assembly and High Level Language.

UNIT IV PROCESSOR 9

Instruction Execution – Building a Data Path – Designing a Control Unit – Hardwired Control, Microprogrammed Control – Pipelining – Data Hazard – Control Hazards.

UNIT V MEMORY AND PROGRAMMABLE LOGIC 9

Memory Concepts and Hierarchy – Memory Management – Cache Memories: Mapping and Replacement Techniques – Virtual Memory – DMA – ROM-Programmable Logic Array-Programmable Array logic.

TOTAL: 45 PERIODS

PRACTICAL EXERCISES: 30 PERIODS

1. Verification of Boolean theorems using logic gates.
2. Design and implementation of combinational circuits using gates for arbitrary functions.
3. Implementation of 4-bit binary adder/subtractor circuits.
4. Implementation of code converters.
5. Implementation of BCD adder, encoder and decoder circuits
6. Implementation of functions using Multiplexers.
7. Implementation of the synchronous counters
8. Implementation of a Universal Shift register.
9. Simulator based study of Computer Architecture

COURSE OUTCOMES:

At the end of the course the students will be able to

CO1: Develop digital fundamentals using number systems, logic gates, Boolean algebra and Karnaugh map.

CO2: Build various combinational circuits using logic gates

CO3: Construct sequential circuits such as flip flops, counters and registers.

CO4: Interpret the functional units of computers, instruction set and addressing modes

CO5: Explain the various functional units of processor, pipelining and hazards.

CO6: Compare the various memory concepts of the processor and programmable logic devices

TOTAL: 45 + 30 = 75 PERIODS

TEXT BOOKS:

1. M. Morris Mano, Michael D. Ciletti, “Digital Design : With an Introduction to the Verilog HDL, VHDL, and System Verilog”, Sixth Edition, Pearson Education, 2018.
2. David A. Patterson, John L. Hennessy, “Computer Organization and Design, The Hardware/Software Interface”, Sixth Edition, Morgan Kaufmann/Elsevier, 2020.

REFERENCE BOOKS:

1. Floyd T.L., "Digital Fundamentals", Charles E., Eleventh edition Pearson,2019.
2. Charles H. Roth, Jr, ‘Fundamentals of Logic Design’, Jaico Books, 7th Edition, 2021.
3. M. Morris Mano, “Digital Logic and Computer Design”, Pearson Education, 2016
4. Carl Hamacher, Zvonko Vranesic, Safwat Zaky, Naraig Manjikian, “Computer Organization and Embedded Systems”, Sixth Edition, Tata McGraw-Hill, 2012.
5. William Stallings, “Computer Organization and Architecture – Designing for Performance”, Tenth Edition, Pearson Education, 2016.

COs	POs												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	3	2	1	1	1	-	-	-	2	1	-	2	3	1	-
2	3	2	1	1	1	-	-	-	2	1	-	-	3	1	-
3	2	2	-	-	1	-	-	-	2	1	-	2	2	1	-
4	2	2	-	-	1	1	-	-	3	2	-	2	2	1	-
5	2	1	-	-	1	-	1	-	2	1	-	-	2	1	-
6	2	1	-	-	1	1	-	-	2	1	-	2	3	1	-
Overall correlation	3	2	1	1	2	1	1	-	3	2	-	2	3	2	-

23CS322	DATABASE MANAGEMENT SYSTEMS LABORATORY	L	T	P	C
		0	0	2	4

COURSE OBJECTIVES:

- To learn and implement important commands in SQL.
- To learn the usage of nested and join queries.
- To understand functions, procedures and procedural extensions of databases.
- To understand design and implementation of typical database applications.
- To understand design of NoSQL
- To be familiar with the use of a front end tool for GUI based application development and its integration with databases

LIST OF EXPERIMENTS

1. Create a database table, add constraints (primary key, unique, check, Not null), insert rows, update and delete rows using SQL DDL and DML commands.
2. Create a set of tables, add foreign key constraints and incorporate referential integrity.
3. Query the database tables using different 'where' clause conditions and also implement aggregate functions.
4. Query the database tables and explore sub queries and simple join operations.
5. Write user defined functions and stored procedures in SQL.
6. Create View and index for database tables with a large number of records.
7. Write row level and statement level SQL Triggers.
8. Create Document, column and graph based data using NOSQL database tools.
9. Add Implement CRUD operation using NOSQL Database.
10. Develop a simple GUI based database application and incorporate all the above mentioned features

TOTAL: 45 PERIODS

COURSE OUTCOMES:

At the end of the course the students will be able to

CO1: Create databases with different types of key constraints.
CO2: Create join queries and explore sub queries.
CO3: Implement queries using aggregate functions.
CO4: Use advanced features such as stored procedures and triggers and incorporate in GUI based application development.
CO5: Create and manipulate data using NOSQL database.
CO6: Develop applications that require a Front-end Tool linked with database

COs	POs												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	2	2	1	1	2	-	-	1	1	1	-	1	2	2	1
2	2	2	1	1	2	-	-	1	1	1	-	1	2	2	1
3	2	2	1	1	2	-	-	1	1	1	-	1	2	2	1
4	2	2	1	1	2	-	-	1	1	1	-	1	2	2	1
5	2	2	1	1	2	-	-	1	1	1	-	1	2	2	1
6	2	2	1	1	2	-	-	1	1	1	-	1	2	2	1
Overall Correlation	2	2	1	1	2	-	-	1	1	1	-	1	2	2	1

23AD322	**OBJECT ORIENTED PROGRAMMING IN C++ AND JAVA LABORATORY**	**L**	**T**	**P**	**C**
		3	**0**	**2**	**4**

COURSE OBJECTIVES:

- To strengthen problem solving ability by using the characteristics of an object-oriented approach.
- To design applications using object-oriented features
- To handle Exceptions in programs.
- The students will be expected to write, compile, run and debug the programs to demonstrate the usage of object-oriented concepts both in C++ and JAVA.

I. Programs to demonstrate the usage of Class, Operator Overloading and Friend Functions.

1. Write a C++ program to display Names, Roll No., and grade of 3 students who have appeared in the examination. Declare the class of name, roll no., and grade. Create an array of class objects. Read and display the contents of the array.
2. Write a Program using *copy constructor* to copy data of anobject to another object.
3. Write a program to design a class representing complexnumbers and having the functionality of performing addition &multiplication of two complex numbers using operator overloading.
4. Write a Program to design a class complex to represent complex numbers. The complex class should use an external function (use it as a friend function) to add twocomplex numbers. The function should return an object of type complex representing the sum of two complex numbers.

II. Basics of Java and Exception Handling

5. Develop a java application with Employee class with Emp_name, Emp_id, Address, Mail_id, Mobile_no as members. Inherit the classes, Programmer, Assistant Professor, Associate Professor and Professor from employee class. Add Basic Pay (BP) as the member of all the inherited classes with 97% of BP as DA, 10 % of BP as HRA, 12% of BP as PF, 0.1% of BP for staff club fund. Generate pay slips for the employees with their gross and net salary.
6. Write a Java Program to create an abstract class named Shape that contains two integers and an empty method named print Area(). Provide three classes named Rectangle, Triangle and Circle such that each one of the classes extends the class Shape. Each one of the classes contains only the method print Area () that prints the area of the given shape.
7. Write a Java program to implement user defined exception handling.
8. Write a Java program that reads a file name from the user, displays information about whether the file exists, whether the file is readable, or writable, the type of file and the length of the file in bytes.

III. The usage of Packages and Interfaces, Multithreaded programming, Generic Programming

9. Write a Java program to perform employee payroll processing using packages. In the java file, Emp.java creates a package employee and creates a class Emp. Declare the variables name,empid, category, bpay, hra, da, npay, pf, grosspay, incometax, and allowance. Calculate the values in methods. Create another java file Emppay.java. Create an object e to call the methods to perform and print values.
10. Write a Java program to create an interface Shape with the getArea() method. Create three classes Rectangle, Circle, and Triangle that implement the Shape interface. Implement the getArea() method for each of the three classes.
11. Write a java program that implements a multi-threaded application that has three threads. The first thread generates a random integer every 1 second and if the value is even, the second thread computes the square of the number and prints. If the value is odd, the third thread will print the value of cube of the number.
12. Write a java program to find the maximum value from the given type of elements using a generic function.

IV. The usage of Event Driven Programming

13. Write a java program to draw lines, arcs, figures, images and text in different Fonts, styles and colours.
14. Write a java program to create Frames using swing.
15. Design a calculator using event-driven programming paradigm of Java with the following options.
    a) Decimal manipulations
    b) Scientific manipulations
16. Write a java program that simulates a traffic light. The program lets the user select one of three lights: red, yellow, or green with radio buttons. On selecting a button, an appropriate message with "stop" or "ready" or "go" should appear above the buttons in a selected color. Initially there is no message shown.

PRACTICAL EXERCISES: 30 PERIODS

COURSE OUTCOMES:

At the end of the course the students will be able to

CO1: Solve the problems using the characteristics of an object-oriented approach.

CO2: Design applications using object-oriented features.

CO3: Develop and implement Java programs that make use of classes, packages and interfaces.

CO4: Develop and implement Java programs with exception handling and multithreading.

CO5: Design applications using file processing, generic programming and event handling.

COs	POs												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	3	2	3	-	2	-	-	-	-	-	-	2	3	-	-
2	3	3	3	-	2	-	-	-	-	-	-	2	3	-	-
3	3	3	3	-	2	-	-	-	-	-	-	2	3	-	-
4	3	2	2	-	2	-	-	-	-	-	-	2	3	-	-
5	3	3	3	-	3	-	-	-	-	-	-	2	3	-	-
Overall Correlation	**3**	**3**	**3**	**-**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**3**	**-**	**-**

23ES391 PRESENTATION SKILLS

	L	T	P	C
	0	**0**	**2**	**1***

COURSE OBJECTIVES:

- To help learners use brainstorming techniques for generating, organizing and outlining ideas.
- To familiarize learners with different speech structures by engaging them in watching speeches with great opening and closing
- To give practice on voice modulation and use of body language and eye contact for making captivating presentations
- To give hands on training on preparing presentation slides and using remote presentation tools
- To train students on responding to question and feedback with confidence.

UNIT I BRAINSTORMING AND OUTLINING 6

Mind Mapping based on prior knowledge, collecting additional information from external resources, giving prompts to Generative AI tools seeking information, organizing ideas generated, knowing your audience

UNIT II STRUCTURING THE PRESENTATION 6

3 Ts of a presentation, writing effective introduction- Beginning the introduction with a hook (question, data, storytelling) and closing the introduction with the objective of the presentation. Structuring the body paragraphs -Choosing key ideas from the list of ideas generated during brainstorming. Substantiating ideas with examples, data, reasons and anecdotes. Summarizing the ideas for conclusion.

UNIT III DELIVERY TECHNIQUES 6

Vocal variety, intonation, reducing filler words and improving articulation, inflection, engaging the audience. Body language- eye contact, gestures, movement on stage.

UNIT IV USE OF TECHNOLOGICAL AIDS 6

Use of presentation software like MS Power Point, Google Slides etc, incorporating images, graphs, charts and videos, using interactive tools like quizzes and polls, using remote presentation tools like zoom, MS Teams, WebEx for screen sharing, virtual whiteboards and chat functionalities, incorporating AR/VR for more immersive presentations .

UNIT V HANDLING QUESTIONS AND FEEDBACK 6

Audience engagement through questions, PAR (Point, Answer, Redirect) strategy for structuring responses to questions. Understanding feedback process - Receiving, interpreting and evaluating constructively, active listening techniques for processing feedback, responding to feedback- acknowledging, clarifying and appreciating, Dealing with challenging feedback.

TOTAL: 30 PERIODS

COURSE OUTCOMES:

After completion of the course, the students should be able to

CO1 construct ideas for presentation through mind mapping techniques

CO2 organize ideas and structure the presentation with captivating introduction, body paragraphs illustrated with examples and reasons and compelling conclusion

CO3 apply vocal variety and body language techniques to enhance delivery

CO4 prepare engaging presentations by integrating multimedia elements

CO5 demonstrate proficiency in delivering presentations in remote platforms utilizing various technological tools and strategies to engage audience in virtual environments

CO6 exhibit active listening skills by responding to questions with clarity and confidence and incorporating constructive feedback for professional development

TEXT BOOKS:

1. "Slide:ology: The Art and Science of Creating Great Presentations" by Nancy Duarte. O'Reilly Media
2. "The Naked Presenter: Delivering Powerful Presentations With or Without Slides" by Garr Reynolds. New Riders

REFERENCE BOOK:

Talk Like TED: The 9 Public-Speaking Secrets of the World's Top Minds" by Carmine Gallo.

23MA411	MATHEMATICAL MODELING FOR DATA SCIENCE	L	T	P	C
		2	0	2	4

COURSE OBJECTIVES:

- Gain knowledge in basics of R language for computation, graphics, and modelling
- Create and manipulate data frames and work with files using R
- Understand the problem that a machine learning algorithm is designed to solve.
- To develop designing skills for modeling non-deterministic problems.
- To educate students in predicting future results according to the parameters.

UNIT I INTRODUCTION TO R PROGRAMMING 6

Introduction-How to run R-Basic features of R- R Sessions and Functions- Basic Math-Variables- Data Types - Advanced Data Structures – Lists, Matrices, Arrays, Factors ,Data Frames, Functions , Vectors , Atomic Vectors, Character vectors - Operations on the logical vectors - Calculating with R.

UNIT II WORKING WITH DATA FRAMES, FILE OPERATIONS IN R 6

Data Frames, Making data frames - Working with data frames- Data Reshaping- Melting and Casting of data – Merging Data Frames - Editing and Reading Data from Files – Reading and Writing Files.

UNIT III DATA MODELS 6

Data, Models, and Learning, Empirical Risk Minimization, Parameter Estimation, Probabilistic Modeling and Inference, Directed Graphical Models, Model Selections

UNIT IV LINEAR REGRESSION AND DIMENSIONALITY REDUCTION 7

Linear Regression - Problem Formulation, Parameter Estimation, Bayesian Linear Regression, Maximum Likelihood as Orthogonal Projection, Dimensionality Reduction with Principal Component Analysis, Maximum Variance Perspective, Projection Perspective, Eigenvector Computation and LowRank Approximations, PCA in High Dimensions, Key Steps of PCA in Practice, Latent Variable Perspective.

UNIT V GAUSSIAN MIXTURE MODELS AND SUPPORT VECTOR MACHINES 6

Gaussian Mixture Model, Parameter Learning via Maximum Likelihood, EM Algorithm, Latent Variable Perspective, SVM - Separating Hyperplanes, Primal Support Vector Machine.

TOTAL: 30 PERIODS

LIST OF EXPERIMENTS:

1. Basic Computations using R
2. Array and List execution using R
3. R Code for Data Frame Manipulation including extraction, Transformation and loading of Data
4. Probabilistic Modeling
5. Linear Algebra – solving linear equations
6. Dimensionality Reduction with Principal Component Analysis
7. Gaussian Mixture Model
8. EM algorithms
9. Support Vector Machines

TOTAL HOURS 30 HOURS

COURSE OUTCOMES:

At the end of the course the students will be able to

CO 1 Test the consistency and solve system of linear equations.
CO 2 Find the basis and dimension of vector space.
CO 3 Obtain the matrix of linear transformation and its eigenvalues and eigenvectors.
CO 4 Find orthonormal basis of inner product space and least square approximation.
CO 5 Find eigenvalues of a matrix using numerical techniques
CO 6 Perform Matrix Decomposition using different techniques

TEXT BOOKS:

1. Tilman M.Davies,"THE BOOK OF R - A FIRST PROGRAMMING AND STATISTICS" Library of Congress Cataloging-in-Publication Data,2016.
2. Marc Peter Deisenroth, A. Aldo Faisal, and Cheng Soon Ong, Mathematics for Machine Learning, Cambridge University Press, 2020.

REFERENCE BOOKS:

1. Matthias Dehmer, Salissou Moutari, Frank Emmert-Streib, Mathematical Foundations of Data Science Using R, De Gruyter Oldenbourg, 2020.
2. Norman Matloff, Probability and Statistics for Data Science: Math + R + Data, CRC Data Science Series, 2019.

COs	POs												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	3	3	3	2	2	-	-	-	2	1	1	1	3	-	-
1	3	3	3	1	1	-	-	-	1	1	2	2	3	-	-
2	2	1	1	3	2	-	-	-	2	2	1	2	3	-	-
3	3	2	1	2	2	-	-	-	2	1	1	2	3	-	-
4	3	2	3	2	2	-	-	-	3	3	3	2	3	-	-
5	3	1	2	3	3	-	-	-	2	2	2	1	3	-	-
6	3	2	2	3	3				2	2	2	1	3	-	-
Overall Correlation	**3**	**2**	**3**	**3**	**3**	**-**	**-**	**-**	**2**	**2**	**2**	**2**	**3**	**-**	**-**

23AD401 DESIGN AND ANALYSIS OF ALGORITHM

L	T	P	C
3	0	0	3

COURSE OBJECTIVES:

- To analyse the efficiency of algorithmic solutions.
- To illustrate graph algorithms using various techniques.
- To explain divide and conquer, dynamic programming and greedy techniques for solving various problems.
- To apply the concept of iterative technique to solve optimization problems and backtracking.
- To familiarize the concept of the limitations of algorithmic power and handling it in different problems.

UNIT I INTRODUCTION 9

Notion of an Algorithm – Fundamentals of Algorithmic Problem Solving –Fundamentals of the Analysis of Algorithm Efficiency – Analysis Framework - Asymptotic Notations and their properties – Solving Recurrences: substitution method - Lower bounds - hash function- String Matching: The naïve string - matching algorithm - Rabin-Karp algorithm

UNIT II GRAPH ALGORITHMS 9

Representations of graphs - Graph Traversal: DFS - BFS - Minimum spanning tree: Kruskal's and Prim's algorithm - Shortest Path: Bellman - Ford algorithm - Dijkstra's algorithm - Maximum flow: Flow networks - Ford-Fulkerson method - Maximum bipartite matching.

UNIT III ADVANCED ANALYSIS TECHNIQUES 9

Divide and Conquer Methodology – Merge Sort - Multiplication of Large Integers and Strassen's Matrix Multiplication – Closest-Pair and Convex - Hull Problems.
Dynamic programming – Principle of optimality - Coin changing problem – Warshall's and Floyd's algorithms – Optimal Binary Search Trees - Multistage graph - Knapsack Problem and Memory functions.
Greedy Technique – Dijkstra's algorithm - Huffman Trees and codes.

UNIT IV OPTIMIATION AND BACKTRACKING TECHNIQUES 9

Branch and Bound: Assignment problem - Knapsack Problem - Travelling Salesman Problem - LIFO Search and FIFO Search - **Backtracking** – N Queens problem - Hamiltonian Circuit Problem – Subset Sum Problem.

UNIT V NP COMPLETE AND APPROXIMATION ALGORITHM 9

Lower - Bound Arguments - P, NP, NP- Complete and NP Hard Problems - NP-completeness - Problem reduction: TSP - 3 CNF problem - Approximation Algorithms for NP-Hard Problems – Traveling Salesman problem – Cook's Theorem – Bin Packing problem.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

At the end of the course the students will be able to

CO1: Analyze the efficiency of various algorithms mathematically.

CO2: Apply graph algorithms to solve problems and analyse their efficiency.

CO3: Implement and analyse the problems using dynamic programming and greedy algorithmic techniques.

CO4: Solve the problems using optimization and backtracking techniques

CO5: Compute the limitations of algorithmic power and solve the problems using branch and bound techniques.

TEXT BOOK:

Anany Levitin, Introduction to the Design and Analysis of Algorithms, Third Edition, Pearson Education, 2012.

REFERENCE BOOKS:

1. Ellis Horowitz, Sartaj Sahni and Sanguthevar Rajasekaran, Computer Algorithms/ C++, Second Edition, Universities Press, 2019.
2. Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest and Clifford Stein, Introduction to Algorithms, Third Edition, PHI Learning Private Limited, 2012.
3. S. Sridhar, Design and Analysis of Algorithms, Oxford university press, 2014.
4. Alfred V. Aho, John E. Hopcroft and Jeffrey D. Ullman, Data Structures and Algorithms, Pearson Education, Reprint 2006.

COs	**POs**												**PSOs**		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	3	3	3	2	2	-	-	-	2	1	1	1	3	-	-
1	3	3	3	1	1	-	-	-	1	1	2	2	3	-	-
2	2	1	1	3	2	-	-	-	2	2	1	2	3	-	-
3	3	2	1	2	2	-	-	-	2	1	1	2	3	-	-
4	3	2	3	2	2	-	-	-	3	3	3	2	3	-	-
5	3	1	2	3	3	-	-	-	2	2	2	1	3	-	-
6	3	2	2	3	3				2	2	2	1	3	-	-
Overall Correlation	**3**	**2**	**3**	**3**	**3**	**-**	**-**	**-**	**2**	**2**	**2**	**2**	**3**	**-**	**-**

23CS401 OPERATING SYSTEMS

	L	T	P	C
	3	0	0	3

COURSE OBJECTIVES:

- To understand the basics and functions of operating systems.
- To understand processes and threads
- To analyze scheduling algorithms and process synchronization.
- To understand the concept of deadlocks.
- To analyze various memory management schemes.
- To be familiar with I/O management and file systems.
- To be familiar with the basics of virtual machines and Mobile OS like iOS and Android.

UNIT I INTRODUCTION **10**

Introduction to Operating Systems – Views of Operating system, Computer System organization, Computer System Architecture; **Operating System Structures** – Operating System Services - User Operating System Interface - System Calls – System Programs - Design and Implementation - Structuring methods; **Processes** - Process Concept, Process Scheduling, Operations on Processes, Inter-process Communication – Shared Memory Systems, Message Passing Systems, **Threads** - Multithread Models.

UNIT II PROCESS MANAGEMENT **11**

CPU Scheduling – Basic Concepts, Scheduling criteria - Scheduling algorithms; **Process Synchronization** - The Critical-Section problem, Synchronization hardware, Mutex Locks, Semaphores, Monitors, Classical problems of synchronization; **Deadlock** – Deadlock Characterization, Methods for handling deadlocks, Deadlock prevention, Deadlock avoidance, Deadlock detection, Recovery from deadlock.

UNIT III MEMORY MANAGEMENT **9**

Main Memory – Address Binding, Logical and Physical Address Space, Contiguous Memory Allocation, Segmentation, Paging, Structure of the Page Table; **Virtual Memory** - Demand Paging, Copy on Write, Page Replacement, Thrashing.

UNIT IV STORAGE MANAGEMENT **8**

Mass Storage system –Disk Scheduling and Management; **I/O Systems** – I/O Hardware, Kernel I/O subsystem; File-System Interface - File concept, Access methods, Directory Structure, File system mounting - File Sharing and Protection; **File System Implementation** - File System Structure - Directory implementation - Allocation Methods - Free Space Management;

UNIT V VIRTUAL MACHINES AND MOBILE OS **9**

Virtual Machines – Benefits and Features, Building Blocks, Types of Virtual Machines and their Implementations, Virtualization and Operating-System Components; Mobile OS - iOS and Android.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

At the end of the course the students will be able to

CO1 Explain operating system structures and various services provided by operating systems

CO2 Apply Process synchronization, process scheduling, and deadlocks concepts in the givenscenario to solve the problems.

CO3 Apply algorithms and suitable techniques for memory management.

CO4 Apply disk scheduling algorithm and explain the management schemes for storage systems such as file and I/O systems.

CO5 Explain the concept of Virtual machines

CO6 Explain the functionalities of iOS and Android Operating Systems.

TEXT BOOK:

Abraham Silberschatz, Peter Baer Galvin and Greg Gagne, "Operating System Concepts", 10th Edition, John Wiley and Sons Inc., 2018.

REFERENCE BOOKS:

1. Ramaz Elmasri, A. Gil Carrick, David Levine, "Operating Systems – A Spiral Approach", Tata McGraw Hill Edition, 2010.
2. William Stallings, "Operating Systems: Internals and Design Principles", 7th Edition, Prentice Hall, 2018.
3. Achyut S.Godbole, Atul Kahate, "Operating Systems", McGraw Hill Education, 2016.

COs	POs												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	2	1	1	1	1	-	-	1	1	1	1	2	2	1	-
2	3	2	1	1	1	-	-	1	1	1	1	2	3	1	-
3	3	2	1	1	1	-	-	1	1	1	1	2	3	1	-
4	2	1	1	1	1	-	-	1	1	1	1	1	1	-	-
5	3	2	1	1	1	-	-	1	1	1	-	1	1	-	-
6	2	1	1	1	1	-	-	1	1	1	-	2	2	1	-
Overall Correlation	3	3	2	1	1	-	-	1	1	1	1	2	2	1	-

23AD402 BIG DATA COMPUTING

	L	T	P	C
	3	0	0	3

COURSE OBJECTIVES:

- To understand big data.
- To learn and use NoSQL big data management.
- To learn big Data Ingestion, Integration using Apache Kafka and Flume.
- To learn MapReduce analytics using Hadoop and related tools.
- To understand the usage of Hadoop related tools for Big Data Analytics

UNIT I INTRODUCTION TO BIG DATA 9

Overview of Big Data: Definition – Characteristics – unstructured data – Importance- -Challenges and Opportunities in Big Data Management – big data and marketing - Evolution of Big Data Technologies- Batch Processing vs. Stream Processing

UNIT II BIG DATA STORAGE 9

Data Storage Technologies: NoSQL databases - aggregate data models – key-value and document data models – relationships – graph databases– master-slave replication-MongoDB - Cassandra – cassandra data model – cassandra examples – cassandra clients.

UNIT III BASICS OF HADOOP 9

Data format – analyzing data with Hadoop – scaling out – Hadoop streaming – Hadoop pipes – design of Hadoop distributed file system (HDFS) – HDFS concepts – Java interface – data flow – Hadoop I/O – data integrity – compression – serialization – Avro – file-based data structures - Cassandra – Hadoop integration.

UNIT IV HADOOP RELATED TOOLS 9

Hbase – data model and implementations – Hbase clients-Thrift implementation – Hbase examples – Pig - Pig Latin scripts – Hive- HiveQL queries.

UNIT V MAPREDUCE APPLICATIONS 9

MapReduce workflows – unit tests with MRUnit – test data and local tests – anatomy of MapReduce job run – classic Map-reduce – YARN – failures in classic Map-reduce and YARN – job scheduling – shuffle and sort – task execution – MapReduce types – input formats – output formats.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

At the end of the course the students will be able to

CO1: Describe big data and use cases from selected business domains.

CO2: Explain NoSQL big data management.

CO3: Install, configure, and run Hadoop and HDFS.

CO4: Perform map-reduce analytics using Hadoop.

CO5: Use Hadoop-related tools such as HBase, Cassandra, Pig, and Hive for big data analytics.

TEXT BOOKS:

1. Balamurugan Balusamy, Nandhini Abirami R, Seifedine Kadry, Amir H. Gandomi, "Big Data: Concepts, Technology, and Architecture", Wiley, 2021.
2. Data Analytics with Hadoop, " Benjamin Bengfort, Jenny Kim", O'Reilly, 2016.
3. Jeff Carpenter, Eben Hewitt, "Cassandra: The Definitive Guide", 3rd , O'Reilly, 2020.

REFERENCE BOOKS:

1. Dayong Du, " Apache Hive Essentials ", O'Reilly, 2018.
2. Lars George, "HBase: The Definitive Guide", 2nd Edition, O'Reilly, 2017.
3. Dan Sullivan. "NoSQL for Mere Mortals", O'Reilly, 2015
4. Alan Gates, "Programming Pig",2nd Edition, O'Reilly, 2016.

COs	**POs**												**PSOs**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
1	3					-	-	-	-	-	-	1	2	2	2
2	2	3			2	-	-	-	-	-	-	1	2	3	3
3	2	2	3	1	2	-	-	-	-	-	-	1	3	2	3
4	2	2	1	3	2	-	-	-	-	-	-	1	2	2	3
5	2	1	2	3	2	-	-	-	-	-	-	1	2	2	3
6	2	1	3	3	2	-	-	-	-	-	-	1	2	3	3
Overall Correlation	3	2	3	3	2	-	-	-	-	-	-	1	2	2	3

23AD403 DATA WAREHOUSING AND DATA MINING

L	T	P	C
3	0	0	3

COURSE OBJECTIVES:

- To understand the principles of Data warehousing
- Learn basic of Data Mining concepts and architecture.
- To be familiar with the association mining.
- To know the classification algorithm implementation
- To understand the clustering algorithms and its application
- To know about the real time application of mining.

UNIT I INTRODUCTION TO DATA WAREHOUSE 9

Data Warehousing and Business Analysis: - Data warehousing Components –Building a Data warehouse –Data Warehouse Architecture – DBMS Schemas for Decision Support – Data Extraction, Cleanup, and Transformation Tools –Metadata – reporting – Query tools and Applications – Online Analytical Processing (OLAP) – OLAP and Multidimensional Data Analysis.

UNIT II DATA MINING AND ASSOCIATION MINING 9

Data Mining: - Data Mining Functionalities – Data Preprocessing – Data Cleaning – Data Integration and Transformation – Data Reduction – Data Discretization and Concept Hierarchy Generation- Architecture of A Typical Data Mining Systems- Classification of Data Mining Systems.

Association Rule Mining: - Apriori Algorithm - Efficient and Scalable Frequent Item set Mining Methods – Mining Various Kinds of Association Rules – Association Mining to Correlation Analysis – Constraint-Based Association Mining.

UNIT III CLASSIFICATION MINING 9

Classification and Prediction: - Issues Regarding Classification and Prediction – Classification by Decision Tree Introduction – Bayesian Classification – Rule Based Classification – Classification by Back propagation – Support Vector Machines – Associative Classification – Lazy Learners – Other Classification Methods – Prediction – Accuracy and Error Measures – Evaluating the Accuracy of a Classifier or Predictor – Ensemble Methods – Model Section.

UNIT IV CLUSTER ANALYSIS 9

Cluster Analysis: - Types of Data in Cluster Analysis – A Categorization of Major Clustering Methods – Partitioning Methods – Hierarchical methods – Density-Based Methods – Grid-Based Methods – Model-Based Clustering Methods – Clustering High-Dimensional Data – Constraint-Based Cluster Analysis – Outlier Analysis.

UNIT V MINING OBJECT, SPATIAL, MULTIMEDIA, TEXT AND WEB DATA 9

Multidimensional Analysis and Descriptive Mining of Complex Data Objects – Spatial Data Mining – Multimedia Data Mining – Text Mining – Mining the World Wide Web

TOTAL: 45 PERIODS

COURSE OUTCOMES:

At the end of the course the students will be able to

CO1: Understand Data warehousing concepts and Implementation.

CO2: Identify the core principles of the mining process.

CO3: Utilize association mining principles.

CO4: Perform classification mining across diverse applications.

CO5: Apply clustering algorithms to a range of datasets.

CO6: Understand the utilization of mining across different sectors.

TEXT BOOK:

Jiawei Han, Micheline Kamber and Jian Pei "Data Mining Concepts and Techniques", Third Edition, Elsevier, 2011.

REFERENCE BOOKS:

1. Alex Berson and Stephen J. Smith "Data Warehousing, Data Mining & OLAP", Tata McGraw – Hill Edition, Tenth Reprint 2007.
2. K.P. Soman, Shyam Diwakar and V. Ajay "Insight into Data mining Theory and Practice", Easter Economy Edition, Prentice Hall of India, 2006.
3. G. K. Gupta "Introduction to Data Mining with Case Studies", Easter Economy Edition, Prentice Hall of India, 2006.
4. Pang-Ning Tan, Michael Steinbach and Vipin Kumar "Introduction to Data Mining", Pearson Education, 2007.

COs	POs												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	3	3	3	3	3	-	-	-	2	2	3	-	-	-	2
2	3	3	3	3	3	-	-	-	2	2	3	-	-	-	3
3	3	3	2	3	2	-	-	-	2	2	3	-	-	-	3
4	3	3	3	2	3	-	-	-	2	2	1	-	-	-	3
5	2	3	3	3	3	-	-	-	2	2	3	-	-	-	3
6	3	3	3	3	3	-	-	-	3	1	3	-	-	-	3
Overall Correlation	3	3	3	3	3	-	-	-	2	2	3	-	-	-	3

23AD411 FUNDAMENTALS OF ARTIFICIAL INTELLIGENCE

	L	T	P	C
23AD411 FUNDAMENTALS OF ARTIFICIAL INTELLIGENCE	3	0	2	4

COURSE OBJECTIVES:

- To gain knowledge in the basic concepts of Artificial Intelligence.
- To acquire skills in problem solving and machine learning techniques.
- To learn the concepts of neural networks and NLP techniques for Artificial intelligence.
- To acquire knowledge in reasoning and ontology techniques.
- To understand the ethics for artificial intelligence.

UNIT I INTRODUCTION **8**

Introduction–Definition – Foundation and History of AI - Future of Artificial Intelligence – Intelligent Agents– Environments – Structure of Agents – Typical Intelligent Agents - Problem solving Methods – AI Problems - Search Strategies – Uninformed Search Techniques

UNIT II INFORMED SEARCH TECHNIQUES **10**

Informed – Heuristics – Local Search Algorithms and Optimization Problems – Best first Search – A* Algorithm - Searching with partial Observations – Constraint Satisfaction Problems – Constraint Propagation – Backtracking Search - Game playing – Minimax Algorithm- Optimal Decisions in Games – Alpha – Beta Pruning.

UNIT III KNOWLEDGE REPRESENTATION **10**

First Order Predicate Logic – Prolog Programming – Unification – Forward Chaining-Backward Chaining – Resolution – Knowledge Representation - Ontological Engineering- Categories and Objects – Time and Event Calculus - Mental Events and Mental Objects - Reasoning Systems for Categories - Reasoning with Default Information - Uncertainty- Bayes' Rule - Naive Bayes Models - Probabilistic Reasoning - Bayesian Networks.

UNIT IV LEARNING **9**

Learning – Regression– Linear algebra - Supervised learning – Logical formulation of learning – Learning using inductive logic programming – Statistical learning- learning with complex data – Learning with hidden variables(EM Algorithm) – Learning Decision Trees – Reinforcement learning.

UNIT V ADVANCES AND APPLICATIONS **8**

Expert systems – Architecture of expert systems – CNN – RNN – NLP – Language Models – Grammar – Parsing – RNN for NLP - NLT(Natural language tasks) - Computer vision.

TOTAL: 45 PERIODS

PRACTICAL EXERCISES: 30 PERIODS

1. Implementing Search Algorithms:
    - Write programs to implement various search algorithms like Depth-First Search (DFS), Breadth-First Search (BFS), Uniform Cost Search (UCS), and A* Search.
    - Test these algorithms on different problem spaces such as simple mazes or the 8-puzzle problem.
2. Machine Learning Basics:
    - Implement simple machine learning algorithms like linear regression or k-nearest neighbors from scratch.
    - Use libraries like scikit-learn or Tensor Flow to implement more complex algorithms like decision trees or neural networks.
3. Prolog Programming:
    - Write a program to implement a basic implementation of sorting a list using Prolog concepts.
    - Demonstrate its effectiveness on a simple binary tree by
      a. Insertion
      b. Deletion

4. Natural Language Processing (NLP):
    - Develop a program to perform text classification using techniques like bag-of-words or TF-IDF.
    - Implement sentiment analysis on a dataset of movie reviews or tweets.

5. Reinforcement Learning:
    - Implement basic reinforcement learning algorithms like Q-learning or SARSA.
    - Apply them to simple environments like grid worlds or maze navigation problems.
6. Ontological Engineering:
    - Build an inheritance concepts using ontology engineering concepts.
    - Develop the concepts of ontology integrating of different modules within an enterprise software system to facilitate communication and interoperability.

7. Computer Vision:
    - Use libraries like OpenCV to implement basic computer vision tasks like edge detection or object recognition.
    - Develop a program to detect faces in images using Haar cascades.
8. Bayesian Networks:
    - Implement algorithms for Bayesian networks such as variable elimination or belief propagation.
    - Demonstrate their use for probabilistic reasoning in scenarios like medical diagnosis or sensor fusion.
9. Expert Systems:
    - Create a basic expert system using a rule-based approach.
    - Use it to provide recommendations or solutions in a specific domain like troubleshooting computer problems or diagnosing illnesses.

10. Game Playing:
    - Develop programs to play classic board games like Tic-Tac-Toe, Connect Four, or Chess.
    - Implement different strategies such as minimax with alpha-beta pruning for more efficient search.

COURSE OUTCOMES:

At the end of the course the students will be able to

- Apply the skills of mathematical thinking and problem-solving skills.
- Use AI using graph theory for solving problems.
- Represent the information acquiring basic knowledge of sampling and estimation.
- Explain apply the knowledge based on hypothesis.
- Get exposure to a wide variety of mathematical concepts used in computer science discipline like probability.

TEXT BOOK:

Stuart Russell and Peter Norvig, "Artificial Intelligence: A Modern Approach", Fourth Edition, Pearson Education, 2022.

REFERENCE BOOKS:

1. Elaine Rich, Kevin Knight, Shivashankar B. Nair "Artificial Intelligence", Third Edition, McGraw-Hill Education, 2017.
2. Dan W Patterson, "Introduction to Artificial Intelligence & Expert Systems", Pearson Education India, 2015.
3. Deepak Khemani," First Course in Artificial Intelligence", McGraw Hill Education, 2017.
4. Nils J. Nilsson," Artificial Intelligence: A New Synthesis", Morgan Kaufmann Publishers, 1998.

COs	**POs**												**PSOs**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
1	3	2	1	1	1	-	-	-	1	1	1	2	3	1	-
2	3	2	1	1	2	-	-	-	2	2	2	2	3	2	-
3	3	2	1	1	2	-	-	-	2	2	1	2	3	2	-
4	3	2	1	1	2	-	-	-	2	2	2	2	3	2	-
5	3	3	2	2	2	-	-	-	2	1	1	2	3	2	-
6	2	1	1	1	2	-	-	-	1	1	1	2	2	2	-
Overall correlation	3	3	2	2	2	-	-	-	2	2	2	2	3	2	-

23CS421 OPERATING SYSTEMS LABORATORY

L	T	P	C
0	0	2	4

COURSE OBJECTIVES:

- To install windows operating systems.
- To understand the basics of Unix command and shell programming.
- To implement various CPU scheduling algorithms.
- To implement Deadlock Avoidance and Deadlock Detection Algorithms
- To be familiar with File Organization and File Allocation Strategies.
- To be understand the working virtual machine.

LIST OF EXPERIMENTS :

1. Installation of windows operating system
2. Illustrate UNIX commands and Shell Programming
3. Process Management using System Calls : Fork, Exit, Getpid, Wait, Close
4. Write a C program to simulate producer-consumer problem using semaphores
5. Write a C program to simulate the concept of Dining-Philosophers problem.
6. To work with inter process communication using pipe.
7. Write a C program that takes one or more file/directory names as command line input and reports following information A) File Type B) Number Of Links C) Time of last Access D) Read, write and execute permissions
8. To write C program to organize the file using single level directory.
9. To write C program to organize the file using two level directory.
10. Mount a USB drive to a specific directory and verify its contents on a Linux system.
11. Configure auto mount for a network share and verify seamless access on multiple client machines.
12. Install any guest operating system like Linux using VMware.
13. Create and mount an encrypted file system, ensuring data security, on a virtual machine

TOTAL : 45 PERIODS

COURSE OUTCOMES:

At the end of the course the students will be able to

CO1: Execute basic UNIX commands and shell programming

CO2: Implement process synchronization concepts

CO3: Implement the concept of interprocess communication

CO4: Implement file systems, including local file systems and network file systems (NFS)

CO5: Implement operations on directories.

CO6: Execute data security on virtual machines

COs	POs												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	3	3	3	3	3	2	1	1	2	2	-	1	3	3	-
2	3	3	3	3	3	2	1	1	2	2	-	1	3	3	-
3	3	3	3	3	3	2	1	1	2	2	-	1	3	3	-
4	3	3	3	3	3	2	1	1	2	2	-	1	3	3	-
5	3	3	3	3	3	2	1	1	2	2	-	1	3	3	-
6	3	3	3	3	3	2	1	1	2	2		1	3	3	-
Overall correlation	3	3	3	3	3	3	2	2	3	3	-	1	3	3	-

23AD421 BIG DATA COMPUTING LABORATORY

L	T	P	C
0	0	4	2

COURSE OBJECTIVES:

- To install and configure Hadoop.
- To implement and use NoSQL big data management.
- To implement MapReduce analytics using Hadoop and related tools.
- To understand the usage of Hadoop related tools for Big Data Analytics

LIST OF EXPERIMENTS :

1. Downloading and installing Hadoop, Hive and HBase; Understanding different Hadoop modes. Startup scripts, Configuration files.
2. Hadoop Implementation of CRUD operations tasks for file management, such as Adding files and directories, retrieving files and Deleting files
3. Practice importing and exporting data from various data bases with Hive and Hbase
4. Implement of Matrix Multiplication with Hadoop MapReduce
5. Implement Word count by processing the dataset into HDFS and produce output by Map-Reduce.
6. Implementation of Hive along with CRUD operations.
7. Implementation of HBase, Installing thrift along with CRUD operations.

Software Requirements:

Hadoop, Python, Java, Hive and HBase, Cassandra, Mango DB

TOTAL : 45 PERIODS

COURSE OUTCOMES:

At the end of the course the students will be able to

CO1: Install, configure, and run Hadoop and HDFS.

CO2: Implement NoSQL big data management.

CO3: Perform map-reduce analytics using Hadoop.

CO4: Perform map-reduce program with dataset.

CO5: Use Hadoop-related tools such as HBase, Cassandra, Pig, and Hive for big data analytics.

COs	POs												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	3	-	-	-	-	-	-	-	-	-	-	1	2	2	2
2	2	3	-	-	2	-	-	-	-	-	-	1	2	3	3
3	2	2	3	1	2	-	-	-	-	-	-	1	3	2	3
4	2	2	1	3	2	-	-	-	-	-	-	1	2	2	3
5	2	1	2	3	2	-	-	-	-	-	-	1	2	2	3
Overall correlation	3	2	3	3	2	-	-	-	-	-	-	1	2	2	3

23ES491 APTITUDE AND LOGICAL REASONING –I

	L	**T**	**P**	**C**
	0	**0**	**2**	**1**

COURSE OBJECTIVES:

- To improve the problem solving and logical thinking ability of the students.
- To acquaint student with frequently asked questions and patterns in quantitative aptitude and logical reasoning.

UNIT I **4**

Numbers, LCM, HCF, Averages, Ratio & Proportion, Mixtures & Allegation.

UNIT II **4**

Percentages, Time and work, Pipes and Cistern, coding and decoding

UNIT III **4**

Time Speed Distance, Train, Boats and Streams, Analogy

UNIT IV **4**

Data Interpretation(BAR,PIE,LINE), Seating arrangement

UNIT V **4**

Simple Interest and Compound Interest, Profit loss and Discount, Partnership,

TOTAL: 20 PERIODS

COURSE OUTCOMES:

At the end of the course the students will be able to

CO 1 Understand the basic concepts of quantitative ability

CO 2 Understand the basic concepts of logical reasoning Skills

CO 3 Increase in critical thinking skills

CO 4 Able to solve campus placements aptitude papers covering Quantitative Ability, Logical Reasoning Ability

TEXT BOOK:

APTIPEDIA, 2nd edition, Wiley Publishers

REFERENCE BOOKS:

1. Quantitative Aptitude – R.S. Agarwal
2. A Modern Approach To Verbal & Non-Verbal Reasoning By R S Agarwal

KCG COLLEGE OF TECHNOLOGY
AUTONOMOUS
REGULATIONS 2023
BE– AUTOMOBILE ENGINEERING
CHOICE BASED CREDIT SYSTEM
CURRICULUM FOR SEMESTERS I TO VIII

SEMESTER–I

SL. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
	23IP101	Induction Programme		-	-	-	-	-
THEORY								
1	23HS101	Essential Communication	HSMC	3	0	0	3	3
2	23MA101	Matrices and Calculus	BSC	3	0	0	3	3
3	23AD101	Programming in Python	ESC	3	0	0	3	3
4	23HS102	Heritage of Tamils	HSMC	1	0	0	1	1
THEORY AND PRACTICALS								
5	23PH111	Engineering Physics	BSC	3	0	2	5	4
6	23CY111	Engineering Chemistry	BSC	3	0	2	5	4
PRACTICALS								
7	23AD121	Python Programming Laboratory	ESC	0	0	4	4	2
8	23HS121	Communication Skills Laboratory	HSMC	0	0	2	2	1
9	23HS122	General Clubs / Technical Clubs / NCC / NSS / Extension Activities	HSMC	0	0	2	2	1*
TOTAL				16	0	12	28	21

SEMESTER –II

SL. NO.	COURSE CODE	COURSE TITLE	CATEG ORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
THEORY								
1	23HS201/ 23HS202	Professional English/ Foreign language	HSMC	3	0	0	3	3
2	23MA203	Statistics and Numerical Methods	BSC	3	1	0	4	4
3	23PH206	Material Science	BSC	3	0	0	3	3
4	23ME201	Applied Mechanics	PCC	3	0	0	3	3
5	23HS203	Tamils and Technology	HSMC	1	0	0	1	1
THEORY AND PRACTICALS								
6	23EE281	Basics Electrical and Electronics Engineering	ESC	2	0	2	4	3
7	23ME211	Engineering Graphics	ESC	3	0	2	5	4
PRACTICALS								
8	23ME221	Engineering Practices Laboratory	PCC	0	0	4	4	2
9	23ME222	Applied Mechanics Laboratory	PCC	0	0	4	4	2
10	23ES291	Soft Skills	EEC	0	0	2	2	1*
TOTAL				18	1	14	33	25

SEMESTER-III

SL. NO.	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
THEORY								
1	23MA302	Transforms and Partial Differential Equations	BSC	3	1	0	4	4
2	23AU301	Thermodynamics and Heat transfer	PCC	3	0	0	3	3
3	23AU302	Automotive Engines	PCC	3	0	0	3	3
4	23HS301	Universal Human Values and Ethics	HSMC	3	0	0	3	3
THEORY AND PRACTICALS								
5	23ME311	Manufacturing Processes	PCC	3	0	2	5	4
6	23AU311	Fuels and Lubricants	PCC	3	0	2	5	4
PRACTICALS								
7	23AU321	Computer Aided Design Laboratory	PCC	0	0	4	4	2
8	23AU322	Automotive Engines Laboratory	PCC	0	0	4	4	2
9	23ES391	Presentation Skills	EEC	0	0	2	2	1*
TOTAL				18	1	14	33	25

SEMESTER-IV

SL. NO.	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
THEORY								
1	23MA401	Optimization Techniques	BSC	3	1	0	4	4
2	23AU401	Automotive Transmission	PCC	3	0	0	3	3
3	23AU402	Automotive Electrical and Electronics Engineering	PCC	3	0	0	3	3
4		Department Elective1	DEC	3	0	0	3	3
5		Department Elective2	DEC	3	0	0	3	3
THEORY AND PRACTICALS								
6	23CE412	Strength of Materials	PCC	3	0	2	5	4
PRACTICALS								
7	23AU421	Automotive Components Laboratory	PCC	0	0	4	4	2
8	23AU422	Automotive Electrical and Electronics Engineering Laboratory	PCC	0	0	4	4	2
9	23ES491	Aptitude and Logical Reasoning - 1	EEC	0	0	2	2	1*
10	23AU423/ 23AU424	Mini Project – 1/ In - Plant Training	EEC	0	0	2	2	1
TOTAL				18	1	14	33	25

SEMESTER-V

SL. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK L	T	P	TOTAL CONTACT PERIODS	CREDITS
THEORY								
1	23RE501	Research Methodology and Intellectual Property Rights	ESC	2	0	0	2	2
2	23AU501	Automotive Chassis	PCC	3	0	0	3	3
3	23AU502	Electric and Hybrid vehicles	PCC	3	0	0	3	3
4		Department Elective 3	DEC	3	0	0	3	3
5		Department Elective 4	DEC	3	0	0	3	3
6		Non- Department Elective - 1 (Emerging Technologies)	NEC	3	0	0	3	3
PRACTICALS								
7	23AU521	Modelling and Simulation Laboratory	PCC	0	0	4	4	2
8	23AU522	Mini Project – 2	EEC	0	0	4	4	2
9	23ES591	Aptitude and Logical Reasoning - 2	EEC	0	0	2	2	1*
TOTAL				17	0	10	27	21

SEMESTER VI

SL. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK L	T	P	TOTAL CONTACT PERIODS	CREDITS
THEORY								
1		Department Elective 5	DEC	3	0	0	3	3
2		Department Elective 6	DEC	3	0	0	3	3
3		Non-Department Elective-2 (Management /Safety Courses)	NEC	3	0	0	3	3
THEORY AND PRACTICALS								
4	23CE611	Environmental Sciences and Engineering	ESC	3	0	2	5	4
5	23AU611	Automotive Engine and Chassis components Design	PCC	3	0	2	5	4
6	23AU612	Two and Three-Wheeler	PCC	3	0	2	5	4
PRACTICALS								
7	23AU621	Project Work - Phase 1	EEC	0	0	4	4	2
8	23AU622	Technical Training	EEC	0	0	2	2	1
9	23AU623	Technical Seminar– 1	ESC	0	0	2	2	1
TOTAL				18	0	14	32	25

SEMESTER -VII

SL. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
THEORY								
1		Non-Department Elective-3 (Management Courses)	NEC	3	0	0	3	3
2	23AU701	Intelligent vehicle Technology	PCC	3	0	0	3	3
3	23AU702	Vehicle Dynamics	PCC	3	0	0	3	3
4	23AU703	Comprehension	EEC	2	0	0	2	2
THEORY AND PRACTICALS								
5	23AU711	Vehicle Maintenance	PCC	3	0	2	5	4
PRACTICALS								
6	23AU721	Project Work - Phase 2	EEC	0	0	6	6	3
7	23AU722	Technical Seminar - 2	ESC	0	0	4	4	2
TOTAL				14	0	12	26	20

SEMESTER -VIII

SL. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
PRACTICALS								
1	23AU821/ 23AU822	Internship / Capstone Project	EEC	0	0	20	20	10
TOTAL				0	0	20	20	10

TOTALCREDITS: 172

DEPARTMENT ELECTIVE COURSES: VERTICALS

VERTICAL 1: ELECTRIC VEHICLES

SL. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1	23AU031	Electric vehicle, Drive and storage system	DEC	3	0	0	4	3
2	23AU032	Batteries and Management system	DEC	3	0	0	4	3
3	23AU033	New Generation and Hybrid Vehicles	DEC	3	0	0	4	3
4	23AU034	Automotive Power Electronics	DEC	3	0	0	4	3
5	23AU035	Fuel cell Technologies	DEC	3	0	0	4	3
6	23AU036	Sensors and Actuators	DEC	3	0	0	4	3
7	23AU037	Automotive Embedded Systems	DEC	3	0	0	4	3
8	23AU038	Automotive Electrical Systems and Drives	DEC	3	0	0	4	3

VERTICAL 2: COMPUTATIONAL DESIGN

SL. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1	23AU039	Computer Aided Design and Manufacturing	DEC	3	0	0	4	3
2	23AU040	Integrated Computational Materials Engineering	DEC	3	0	0	4	3
3	23AU041	Vehicle design data characteristics	DEC	3	0	0	4	3
4	23AU042	Computational and Visualization Theory	DEC	3	0	0	4	3
5	23AU043	Computer Integrated Manufacturing in Automotive Sector	DEC	3	0	0	4	3
6	23AU044	CFD and Heat transfer	DEC	3	0	0	4	3
7	23AU045	Mechanics of Machines	DEC	3	0	0	4	3
8	23AU046	Machine Design	DEC	3	0	0	4	3

VERTICAL 3: VEHICLE RESEARCH AND VALIDATION

SL. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1	23AU047	Advanced Automotive Materials	DEC	3	0	0	4	3
2	23AU048	Automotive Functional Safety	DEC	3	0	0	4	3
3	23AU049	Combustion Thermodynamics and Heat Transfer	DEC	3	0	0	4	3
4	23AU050	Alternative Fuels and Energy Systems	DEC	3	0	0	4	3
5	23AU051	Automotive Instrumentation	DEC	3	0	0	4	3
6	23AU052	Testing and Measurement Systems	DEC	3	0	0	4	3
7	23AU053	Vehicle Body Engineering	DEC	3	0	0	4	3
8	23AU054	IC Engine Process Modelling	DEC	3	0	0	4	3

VERTICAL 4: SPECIAL PURPOSE VEHICLES

SL. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1	23AU055	Agricultural Vehicles	DEC	3	0	0	4	3
2	23AU056	Defence Vehicles	DEC	3	0	0	4	3
3	23AU057	Construction Vehicles	DEC	3	0	0	4	3
4	23AU058	Marine Vehicles	DEC	3	0	0	4	3
5	23AU059	Space vehicles	DEC	3	0	0	4	3
6	23AU060	Gas Dynamics and Jet Propulsion	DEC	3	0	0	4	3
7	23AE072	Drone Technologies	DEC	3	0	0	4	3
8	23AU062	Autonomous and Connected Vehicles	DEC	3	0	0	4	3

VERTICAL 5: PRODUCT AND PROCESS DEVELOPMENT

SL. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1	23AU063	Automotive Product Design	DEC	3	0	0	4	3
2	23AU064	Ergonomics in Automotive Design	DEC	3	0	0	4	3
3	23AU065	Vehicle Control Systems	DEC	3	0	0	4	3
4	23ME031	Additive Manufacturing	DEC	3	0	0	4	3
5	23AU067	Introduction to Finite Element Analysis	DEC	3	0	0	4	3
6	23AU068	New Product Development Process	DEC	3	0	0	4	3
7	23AU069	Automotive Product Life Cycle Management	DEC	3	0	0	4	3
8	23AU070	Dynamics of Ground Vehicles	DEC	3	0	0	4	3

VERTICAL 6: DIVERISIFIED COURSES GROUP

SL. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1	23AU071	Hydraulics and Pneumatics	DEC	3	0	0	4	3
2	23AU072	Fundamentals of Nano science	DEC	3	0	0	4	3
3	23AU073	Road Vehicle Aerodynamics	DEC	3	0	0	4	3
4	23AU074	Lean Six Sigma	DEC	3	0	0	4	3
5	23AU075	Renewable Sources of Energy	DEC	3	0	0	4	3
6	23AU076	Vehicle Air – Conditioning	DEC	3	0	0	4	3
7	23AU077	Solar Energy Technology	DEC	3	0	0	4	3
8	23AU078	Digital Manufacturing of Automobiles	DEC	3	0	0	4	3

NON-DEPARMENT ELECTIVE

EMERGING TECHNOLOGY

SL NO	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1	23NE972	Block Chain Technology	NEC	3	0	0	3	3
2	23NE973	Artificial Intelligence and Machine Learning Fundamentals	NEC	3	0	0	3	3
3	23NE974	Augmented Reality and Virtual Reality	NEC	3	0	0	3	3
4	23NE975	IoT concepts and applications	NEC	3	0	0	3	3
5	23NE976	Data Science and Fundamentals	NEC	3	0	0	3	3
6	23NE977	Remote Sensing Concepts	NEC	3	0	0	3	3
7	23NE983	Aviation Management	NEC	3	0	0	3	3
8	23NE986	Foundation of Robotics	NEC	3	0	0	3	3

MANAGEMENT COURSES

SL NO	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1	23HS971	Total Quality Management	NEC	3	0	0	3	3
2	23HS972	Engineering Economics and Financial Accounting	NEC	3	0	0	3	3
3	23HS973	Engineering Management and Law	NEC	3	0	0	3	3
4	23HS974	Knowledge Management	NEC	3	0	0	3	3
5	23HS975	Industrial Management	NEC	3	0	0	3	3
6	23HS976	Entrepreneurship and Business Opportunities	NEC	3	0	0	3	3
7	23HS977	Modern Business Administration and Financing	NEC	3	0	0	3	3
8	23HS978	Essentials of Management	NEC	3	0	0	3	3

SAFETY COURSES

SL NO	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1	23HS979	Disaster Management	NEC	3	0	0	3	3
2	23HS980	Industrial Safety	NEC	3	0	0	3	3
3	23HS981	Automotive Safety	NEC	3	0	0	3	3

SEMESTER-WISE CREDIT DISTRIBUTION

SEMESTER	HSMC	BSC	ESC	PCC	DEC	NEC	EEC	Total
Semester I	5	11	5					**21**
Semester II	4	7	7	7				**25**
Semester III	3	4		18				**25**
Semester IV		4		14	6		1	**25**
Semester V			2	8	6	3	2	**21**
Semester VI			5	8	6	3	3	**25**
Semester VII			2	10		3	5	**20**
Semester VIII							10	**10**
Total	**12**	**26**	**21**	**65**	**18**	**9**	**21**	**172**

23MA302	TRANSFORMS AND PARTIAL DIFFERENTIAL EQUATIONS	L	T	P	C
		3	1	0	4

COURSE OBJECTIVES:

- To introduce the basic concepts of PDE for solving standard partial differential equations.
- To introduce Fourier series analysis which is central to many applications in engineering apart from its use in solving boundary value problems.
- To acquaint the student with Fourier series techniques in solving heat flow problems used in various situations.
- To acquaint the student with Fourier transform techniques used in wide variety of situations.
- To introduce the effective mathematical tools for the solutions of partial differential equations that model several physical processes and to develop Z transform techniques for discrete time systems

UNIT I PARTIAL DIFFERENTIAL EQUATIONS 9+3

Formation of partial differential equations –Solutions of standard types of first order partial differential equations - Lagrange's linear equation - Linear partial differential equations of second and higher order with constant coefficients of both homogeneous and non-homogeneous types.

UNIT II FOURIER SERIES 9+3

Dirichlet's conditions – General Fourier series – Odd and even functions – Half range sine series and cosine series – Root mean square value – Parseval's identity – Harmonic analysis.

UNIT III APPLICATIONS OF PARTIAL DIFFERENTIAL EQUATIONS 9+3

Classification of second order Quasi Linear PDE – Method of separation of variables - Fourier series solutions of one dimensional wave equation – One dimensional equation of Heat conduction – Steady state solution of two dimensional equation of heat conduction (Infinite) (Cartesian coordinates only)

UNIT IV FOURIER TRANSFORMS 9+3

Statement of Fourier integral theorem– Fourier transform pair – Fourier sine and cosine transforms – Properties – Transforms of simple functions – Convolution theorem (Without proof) – Parseval's identity.

UNIT V Z-TRANSFORMS AND DIFFERENCE EQUATIONS 9+3

Z-transforms - Elementary properties – Convergence of Z-transforms – Initial and final value theorems - Inverse Z-transform using partial fraction and convolution theorem - Formation of difference equations – Solution of difference equations using Z - transforms.

TOTAL: 60 PERIODS

COURSE OUTCOMES:

At the end of the course the students will be able to

CO 1 Understand how to solve the given standard partial differential equations.

CO 2 Understand Fourier series analysis which plays a vital role in engineering applications.

CO 3 Examine the physical significance of Fourier series techniques in solving one and two dimensional heat flow problems and one dimensional wave equations.

CO 4 Understand the mathematical principles on Fourier transforms to solve some of the physical problems of engineering.

CO 5 Understand Z transforms , inverse Z transforms and its elementary properties

CO 6 Apply the effective mathematical tools for the solutions of difference equations by using Z transform techniques for discrete time systems.

TEXT BOOKS:

1. Kreyszig.E, "Advanced Engineering Mathematics", John Wiley and Sons, 10th Edition, New Delhi, 2016.
2. Grewal.B.S., “Higher Engineering Mathematics”, Khanna Publishers, New Delhi, 44th Edition, 2018.
3. P.Sivaramakrishna Das and C.Vijayakumari “A Text Book on TPDE” Pearson Publications

REFERENCE BOOKS:

1. Narayanan. S., Manicavachagom Pillay.T.K and Ramanaiah.G "Advanced Mathematics for Engineering Students", Vol. II & III, S.Viswanathan Publishers Pvt. Ltd, Chennai, 1998.
2. Ramana. B.V., "Higher Engineering Mathematics", McGraw Hill Education Pvt. Ltd, New Delhi, 2018.

COs	**POs**												**PSOs**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
1	3	3	3	-	-	-	-	-	-	-	-	2	2	-	1
2	3	3	3	-	-	-	-	-	-	-	-	2	2	-	1
3	2	2	2	-	-	-	-	-	-	-	-	2	2	-	1
4	3	3	3	-	-	-	-	-	-	-	-	2	2	-	1
5	2	2	2	-	-	-	-	-	-	-	-	2	2	-	1
6	2	2	2	-	-	-	-	-	-	-	-	2	2	-	1
Overall correlation	3	3	2	-	-	-	-	-	-	-	-	2	2	-	1

23AU301 THERMODYNAMICS AND HEAT TRANSFER

	L	T	P	C
	3	0	0	3

COURSE OBJECTIVES:

- To explain and apply the laws of thermodynamics and analyze air standard cycles.
- To demonstrate Steam power cycles and Refrigeration and Air conditioning cycles.
- To develop the ability to solve complex heat transfer problems using mathematical and analytical methods and design heat exchangers for efficient heat transfer.

UNIT I BASIC THERMODYNAMICS 9

Systems, closed, open and isolated. Property, state, path and process, quasi-static process, Zeroth law, first law. Steady flow energy equation. Engineering Applications of Steady flow energy equation. Heat and work transfer in flow and non-flow processes. Second law, Kelvin-Planck statement – Clausius statement.

UNIT II AIR STANDARD CYCLES AND COMPRESSORS 9

Cycle, Carnot cycle, Otto, Diesel, Dual combustion and Brayton cycles; Calculation of Air standard efficiency. Compressors, Classifications of compressors, Reciprocating compressor- Rotary, Axial and Vane compressors.

UNIT III STEAM PROPERTIES AND CYCLE 9

Formation of steam and its thermodynamic properties, T-s and h-s diagrams. Properties of steam, Dryness fraction, Quality of steam by steam tables and Mollier chart – Simple Rankine cycle, Efficiency, Steam Nozzles, Types of nozzles, Friction in nozzles (descriptive).

UNIT IV REFRIGERATION AND AIR-CONDITIONING 10

Construction and working principles of refrigeration, Vapour compression system - Vapour absorption types, Comparison – Definition of Co-efficient of performance (COP), Properties of refrigerants – Basic principle, summer, winter and year round Air conditioning.

UNIT V INTRODUCTION TO HEAT TRANSFER 8

Modes of heat transfer, Heat conduction in parallel, radial and composite wall – Heat conduction through hollow and composite cylinders. Basics of Convective heat transfer and Fundamentals of radiative heat transfer (descriptive only) – Types of heat exchangers, Logarithmic Mean Temperature Difference (LMTD).

TOTAL: 45 PERIODS

COURSE OUTCOMES:

At the end of the course the students will be able to

CO1: Demonstrate the understanding of fundamental thermodynamic concepts.
CO2: Interpret the laws of thermodynamics and its application to systems and cycles.
CO3: Solve any flow specific problem in an engineering approach based on basic concepts and logic sequences.
CO4: Compare and contrast between various types of refrigeration and air conditioning cycles.
CO5: Categorize the modes of heat transfer and solve problems involving heat conduction through various materials.
CO6: Determine the amount of heat transfer by heat exchanger.

TEXT BOOKS:

1. Chattopadhyay. P "Engineering Thermodynamics", oxford University Press, New Delhi, 2nd Edition, 2016.
2. Nag. P.K., "Engineering Thermodynamics", Tata McGraw-Hill, New Delhi, 6th edition, 2017.

REFERENCE BOOKS:

1. Arora C.P, "Thermodynamics", Tata McGraw-Hill, New Delhi, 2003.
2. Holman. J. P., "Thermodynamics", 3rd Ed. McGraw-Hill, 2007.
3. Mathur & Sharma Steam Tables, Jain Publishers, New Delhi, 2013.
4. Merala C, Pother, Craig W, Somerton, "Thermodynamics for Engineers", Schaum Outline Series, Tata McGraw-Hill, New Delhi, 2004.

COs	**POs**												**PSOs**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
1	3	3	2	2	-	-	-	-	-	-	-	-	3	-	-
2	3	3	3	3	-	-	-	-	-	-	-	-	3	-	-
3	3	3	3	3	-	-	-	-	-	-	-	-	3	-	-
4	3	3	2	2	-	-	-	-	-	-	-	-	3	-	-
5	3	3	3	3	-	-	-	-	-	-	-	-	3	-	-
6	3	3	3	3	-	-	-	-	-	-	-	-	3	-	-
Overall correlation	3	3	3	3	-	-	-	-	-	-	-	-	3	-	-

23AU302 AUTOMOTIVE ENGINES

L	T	P	C
3	0	0	3

COURSE OBJECTIVES:

- To acquire knowledge on the primary engine components and the subsystems of automotive engines.
- To understand spark ignition and compression ignition engines fuel systems in automotives.
- To develop understanding of combustion process in SI and CI engines and the requirements of cooling and lubrication systems.

UNIT I ENGINE FUNDAMENTALS 9

Engine types and their operation- classifications – Terminology- Four stroke and two stroke cycle- Engine components, working principle of SI and CI engines – Engine operating parameters- Fuel – air and actual cycle analysis – Engine emissions – valve and port timing diagram – firing order.

UNIT II FUEL SUPPLY SYSTEM AND IGNITION SYSTEM 9

SI Engine: Air – Fuel ratio, Simple Carburetor – Injection systems – Single point and Multipoint fuel injection – Gasoline Direct Injection. Ignition System – Battery Ignition System – Magneto Ignition System – Electronic Ignition Systems.
CI Engine: Jerk type fuel injection pump – Distributor type fuel injection pump. Common rail direct injection system – Fuel injector.

UNIT III COMBUSTION IN SI ENGINES 9

Combustion process – Stages of combustion, Flame propagation – Flame velocity and area of flame front – Rate of pressure rise – Cycle to cycle variation, Abnormal combustion – Effect of engine operating and design variables on combustion, Combustion chambers – Types, Factors controlling combustion chamber design.

UNIT IV COMBUSTION IN CI ENGINES 9

Importance of air motion – Swirl, squish and tumble – Swirl ratio. Fuel air mixing – Stages of combustion – Delay period – Factors affecting delay period, Knock in CI engines – Methods of controlling diesel knock. CI engine combustion chambers – Combustion chamber design objectives – Open and divided. Induction swirl, turbulent combustion chambers. – Air cell chamber – Combustion chamber.

UNIT V ENGINE SUBSYSTEM 9

Types of cooling systems and its working, Properties of coolants. Crankcase ventilation. Engine lubrication – Types of lubricating systems and its working – Supercharging and Turbocharging – Types – Working principle.

TOTAL:45 PERIODS

COURSE OUTCOMES:

At the end of the course the students will be able to

CO1: Describe the construction and working of IC engine and its cycle.

CO2: Explain the various fuel system, injection system and ignition system used in SI and CI engines.

CO3: Elaborate the combustion process in SI Engine for understanding the performance and emission characteristics.

CO4: Discuss the combustion process in CI Engine for understanding the performance and emission characteristics.

CO5: Summarize the working of lubrication, cooling, Turbocharging and supercharging systems.

CO6: Demonstrate knowledge on recent developments of prime sources.

TEXT BOOKS:

1. Ganesan V, "Internal combustion engines", 4th edition, Tata McGraw Hill Education, 2017.
2. M.L. Mathur and R.P.Sharma, Internal Combustion Engine, Dhanpath Rai Publications (P) Ltd, New Delhi 110002

REFERENCE BOOKS:

1. Rajput R. K, "A textbook of Internal Combustion Engines – 2nd edition, Laxmi Publications (P) Ltd, 2017
2. Heinz Hesiler, Advanced engine technology. Butterworth Heinmann publications, 1995.
3. Heldt, P.M., High Speed Combustion Engines, Oxford IBH Publishing Co., Calcutta, 1965.
4. K. K. Ramalingm, Internal Combustion Engines, SciTech publications, Chennai, 2018.

COs	**POs**												**PSOs**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
1	3	2	1	1	-	-	-	-	-	-	-	-	2	-	-
2	3	2	1	1	-	-	-	-	-	-	-	-	3	-	-
3	3	2	1	1	-	-	-	-	-	-	-	-	3	-	-
4	3	2	1	1	-	-	-	-	-	-	-	-	3	-	-
5	3	2	1	1	-	-	-	-	-	-	-	-	3	-	-
6	3	2	1	1	-	-	-	-	-	-	-	-	3	-	-
Overall correlation	3	2	1	1	-	-	-	-	-	-	-	-	3	-	-

23HS301	UNIVERSAL HUMAN VALUES AND ETHICS	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- Development of a holistic perspective based on self-exploration about themselves (human being), family, society and nature/existence.
- Understanding (or developing clarity) of the harmony in the human being, family, society and nature/existence.
- Strengthening of self-reflection.
- Development of commitment and courage to act.

UNIT I COURSE INTRODUCTION 9

Need, Basic Guidelines, Content and Process for Value Education - Understanding the need, basic guidelines, content and process for Value Education -Self Exploration–what is it? - its content and process; 'Natural Acceptance' and Experiential Validation- as the mechanism for self exploration - Continuous Happiness and Prosperity- A look at basic Human Aspirations -Right understanding, Relationship and Physical Facilities- the basic requirements for fulfilment of aspirations of every human being with their correct priority -Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario -Method to fulfil the above human aspirations: understanding and living in harmony at various levels.

UNIT II UNDERSTANDING HARMONY IN THE HUMAN BEING 9

Harmony in Myself- Understanding human being as a co-existence of the sentient 'I' and the material 'Body' -Understanding the needs of Self ('I') and 'Body' - Sukh and Suvidha- Understanding the Body as an instrument of 'I' (I being the doer, seer and enjoyer) - Understanding the characteristics and activities of 'I' and harmony in 'I' -Understanding the harmony of I with the Body: Sanyam and Swasthya; correct appraisal of Physical needs, meaning of Prosperity.

UNIT III UNDERSTANDING HARMONY IN THE FAMILY AND SOCIETY 9

Harmony in Human-Human Relationship -Understanding Harmony in the family – the basic unit of human interaction -Understanding values in human-human relationship; meaning of Nyaya and program for its fulfilment to ensure satisfaction; Trust(Vishwas) and Respect as the foundational values of relationship -Understanding the meaning of Vishwas; Difference between intention and competence -Understanding the meaning of Samman, Difference between respect and differentiation; the other salient values in relationship -Understanding the harmony in the society (society being an extension of family)-Visualizing a universal harmonious order in society- Undivided Society (Akhand Samaj), Universal Order- from family to world family.

UNIT IV ENGINEERING ETHICS **9**

Senses of ‗Engineering Ethics‟ – Variety of moral issues – Types of inquiry – Moral dilemmas – Moral Autonomy – Kohlberg's theory – Gilligan's theory – Consensus and Controversy – Models of professional roles - Theories about right action – Self-interest – Customs and Religion – Uses of Ethical Theories.

UNIT V SAFETY, RESPONSIBILITY AND RIGHTS **9**

Safety and Risk – Assessment of Safety and Risk – Risk Benefit Analysis and Reducing Risk - Respect for Authority – Collective Bargaining – Confidentiality – Conflicts of Interest – Occupational Crime – Professional Rights – Employee Rights – Intellectual Property Rights (IPR) – Discrimination-Moral Leadership –Code of Conduct – Corporate Social Responsibility.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

At the end of the course the students will be able to

CO1: Understand the need of value education.

CO2: Comprehend the difference between self and body.

CO3: Understand the need to exist as an unit of Family and society.

CO4: Understand Harmony at all levels.

CO5: Apply the values acquired in the professional front.

CO6: Identify appropriate technologies for ecofriendly production systems.

TEXT BOOKS:

1. Human Values and Professional Ethics by R R Gaur, R Sangal, G P Bagaria, Excel Books, New Delhi, 2010 3.
2. Mike W. Martin and Roland Schinzinger, ―Ethics in Engineering‖, Tata McGraw Hill, New Delhi, 2003.
3. Govindarajan M, Natarajan S, Senthil Kumar V. S, ―Engineering Ethics‖, Prentice Hall of India, New Delhi, 2004

REFERENCE BOOKS:

1. Jeevan Vidya: Ek Parichaya, A Nagaraj, Jeevan Vidya Prakashan, Amarkantak, 1999.
2. Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004.
3. The Story of Stuff (Book).
4. The Story of My Experiments with Truth - by Mohandas Karamchand Gandhi AICTE Model Curriculum in Humanities, Social Science and Management Courses (UG Engineering & Technology) 169 | Page .
5. Small is Beautiful - E. F Schumacher.
6. Slow is Beautiful - Cecile Andrews.
7. Economy of Permanence - J C Kumarappa 8. Bharat Mein Angreji Raj – Pandit Sunderlal.

8. Rediscovering India - by Dharampal.
9. Hind Swaraj or Indian Home Rule - by Mohandas K. Gandhi .
10. India Wins Freedom - Maulana Abdul Kalam Azad.
11. Vivekananda - Romain Rolland (English) 13. Gandhi - Romain Rolland (English).
12. Charles B. Fleddermann, ―Engineering Ethics‖, Pearson Prentice Hall, New Jersey, 2004.
13. Charles E. Harris, Michael S. Pritchard and Michael J. Rabins, ―Engineering Ethics – Concepts and Cases‖, Cengage Learning, 2009.

WEB SOURCES:

1. www.onlineethics.org
2. www.nspe.org
3. www.globalethics.org

COs	POs												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	-	-	-	-	-	3	3	3	3	3	-	-	-	-	3
2	-	-	-	-	-	3	3	3	3	3	-	-	-	-	3
3	-	-	-	-	-	3	3	3	3	3	-	-	-	-	3
4	-	-	-	-	-	3	3	3	3	3	-	-	-	-	3
5	-	-	-	-	-	3	3	3	3	3	-	-	-	-	3
6	-	-	-	-	-	3	3	3	3	3	-	-	-	-	3
Overall correlation	-	-	-	-	-	3	3	3	3	3	-	-	-	-	3

23ME311 MANUFACTURING PROCESSES

	L	T	P	C
	3	**0**	**2**	**4**

COURSE OBJECTIVES:

The learning objective of this course is

- To illustrate the working principles of various metal casting processes.
- To learn and apply the working principles of various metal joining processes.
- To analyze the working principles of bulk deformation of metals.
- To study the concepts and basic mechanics of metal cutting and the factors affecting machinability.
- To learn working of basic and advanced turning machines and super finishing process.

UNIT I METAL CASTING PROCESSES 9+6

Sand Casting: Sand Mould – Type of Patterns - Pattern Materials - Cores –Types and Applications –Melting Furnaces: Cupola Furnaces; Principle of Special Casting Processes: Shell - Investment – Pressure Die Casting - Centrifugal Casting – Stir Casting – CO_2 Casting; Defects in Sand Casting Process-Remedies.

UNIT II PRINCIPLES & APPLICATIONS OF JOINING PROCESSES 9+6

Operating Principle, Basic Equipment, Merits And Applications of: Fusion Welding Processes: Gas Welding - Manual Metal Arc Welding – Gas Tungsten Arc Welding - Gas Metal Arc Welding – Submerged Arc Welding; Operating Principle And Applications of: Resistance Welding - Plasma Arc Welding – Thermit Welding; Brazing And Soldering; Weld Defects.

UNIT III FORMING PROCESSES 9+6

Hot and Cold Working of metal – Forging processes- Open, impression and closed die forging - Rolling Mills – Rolling Operations - Principle of rod and wire drawing – Principles of Extrusion – Types – Hot and Cold extrusion. . Sheet metal operations – Blanking, Punching and Working principle and applications – Hydro forming – Metal spinning and Explosive forming,

UNIT IV MECHANICS OF METAL CUTTING 9+6

Mechanics of Chip Formation, Forces in Machining, Types of Chip, Cutting Tools – Single Point Cutting Tool Nomenclature, Orthogonal and Oblique Metal Cutting, Thermal Aspects, Cutting Tool Materials, Tool Wear, Tool Life, Surface Finish, Cutting Fluids.

UNIT V TURNING, GEAR CUTTING, SHAPING AND FINISHING PROCESSES 9+6

Centre Lathe, Constructional Features, Specification, Operations - Taper Turning Methods, Thread Cutting- Capstan and Turret Lathes. Gear cutting, Gear hobbing and Gear shaping. Types of grinding Process – Cylindrical grinding, surface grinding and internal grinding, Shaper and Milling machines and operations

LIST OF EXPERIMENTS

1. Preparing green sand moulds with cast patterns.
2. Taper Turning and Eccentric Turning on circular parts using lathe machine.

3. Knurling, external and internal thread cutting on circular parts using lathe machine.
4. Shaping – Square and Hexagonal Heads on circular parts using shaper machine.
5. Drilling using radial drilling machine.
6. Cutting spur and helical gear using milling machine.
7. Generating gears using gear hobbing machine.
8. Generating gears using gear shaping machine.
9. Grinding components using cylindrical grinding machine.
10. Grinding components using surface grinding machine

TOTAL: 45+30 PERIODS

COURSE OUTCOMES:

At the end of the course the students will be able to

CO1: Explain the principle of different metal casting processes.

CO2: Describe the various metal joining processes.

CO3: Summarize various bulk deformation processes and sheet metal forming processes.

CO4: Apply the mechanism of metal removal process and to identify the factors involved in Improving machinability.

CO5: Explain the constructional and operational features of Centre lathe and other special purpose Lathes.

CO6: Describe the constructional features of gear cutting and super finishing process.

TEXT BOOKS:

1. Kalpakjian, S., "Manufacturing Engineering and Technology", Pearson education India, 4th Edition, 2009.
2. P.N.Rao Manufacturing Technology Volume 1 Mc Grawhill Education 5th edition, 2018.

REFERENCE BOOKS:

1. Rao. P.N "Manufacturing Technology," Metal Cutting and Machine Tools, Tata McGraw- Hill, New Delhi, 2009.
2. Hajra Chouldhary S.K and Hajra Choudhury. AK., Elements of workshop Technology, volume I and II, Media promoters and Publishers Private Limited, Mumbai, 1997
3. Sharma, P.C., A Text book of production Technology, S.Chand and Co. Ltd., 2004

Cos	POs												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	3	3	2	2	-	-	-	-	-	-	1	1	3	2	2
2	3	3	2	2	-	-	-	-	-	-	1	1	3	2	2
3	3	3	2	2	-	-	-	-	-	-	1	1	3	2	2
4	3	3	2	2	-	-	-	-	-	-	1	1	3	2	2
5	3	3	2	2	-	-	-	-	-	-	1	1	3	2	2
6	3	3	2	2	-	-	-	-	-	-	1	1	3	2	2
Overall correlation	3	3	2	2	-	-	-	-	-	-	1	1	3	2	2

23AU311 FUELS AND LUBRICANTS

	L	T	P	C
	3	0	2	4

COURSE OBJECTIVES:

- To study the world energy scenario in automotive sector and the conventional fuels for IC engines, its production, characteristics and additives.
- To impart the knowledge of alternate liquid fuels and gaseous fuels for engines with their compatibility, performance and emission characteristics.
- To know about the need of lubricants, factors influencing the lubricants and testing of fuels.

UNIT I CONVENTIONAL FUELS FOR I.C. ENGINES 9

Petroleum based conventional fuels for SI and CI engine, Demand and Availability of crude oil – Production - National and International standards for conventional fuels. Crude Distillation, Chemical structure, desirable characteristics of SI Engine fuels – Petrol – Properties, Specification, Volatility characteristics, knock rating and additives. Desirable characteristics of CI Engine fuels – Diesel – Properties, Specification, Chemical structure, Ignition quality, Cetane rating and additives.

UNIT II LIQUID FUELS 9

Need for alternative liquid fuels - Availability, Properties, Composition, Merits, Demerits, Performance and Emission characteristics of Methanol, Ethanol, Straight Vegetable Oil, Bio diesel (Esterification) and their blends.

UNIT III GASEOUS FUELS 9

Need for alternative gaseous fuels – Availability, Properties, Composition, Merits, Demerits, Performance and Emission characteristics of Hydrogen, Compressed Natural Gas (CNG), Liquefied Petroleum Gas (LPG). Modifications required for LPG and CNG in the conventional engines.

UNIT IV COMBUSTION OF FUELS 9

Stoichiometry – Calculation of theoretically correct air required for combustion of liquid and gaseous fuels – Volumetric and gravimetric analysis of the dry products of combustion, Mass of dry gas per kg of fuel burnt, Mass of carbon in the exhaust gas, Mass of carbon burnt to carbonmonoxide per kg of fuel, Heat loss due to incomplete combustion.

UNIT V LUBRICANTS AND TESTING OF FUELS 9

Lubricants: Need for lubricants, engine friction, Effect of engine variables on friction requirements of automotive lubricants- Mineral & Synthetic, Classification of lubricating oils, Properties of lubricating oils, Additives and tests on lubricants – Grease, Classification, Properties, Testing of grease.

Testing of fuels: Relative density, Calorific value, Distillation, Reid vapour pressure, Flash point, Spontaneous ignition temperature, Viscosity, Pour point, Flammability, Ignitability, Diesel index, API gravity and aniline point.

TOTAL: 45 PERIODS

LIST OF EXPERIMENTS

1. Distillation test of liquid fuels
2. Aniline Point test of diesel
3. Calorific value of liquid fuel.
4. Reid vapour pressure test.
5. Flash and Fire points of fuel and oil.
6. Copper strip Corrosion Test
7. Cloud & Pour point Test
8. Temperature dependence of viscosity of lubricants by Redwood Viscometer
9. Viscosity Index of lubricants by Saybolt Viscometer
10. Ash content and Carbon Residue Test
11. Drop point of grease and mechanical penetration in grease
12. Density determination of different fuels

COURSE OUTCOMES:

At the end of the course the students will be able to

CO1: Explain the distillation process, additives for fuels and characteristics of fuels.
CO2: Discuss the need and performance characteristics of alternative liquid fuels for both SI and CI engines.
CO3: Describe the need and performance characteristics of alternative gaseous fuels for both SI and CI engines.
CO4: Calculate theoretically correct air required for combustion of liquid and gaseous fuels and estimate quantitatively the exhaust gas constituents.
CO5: Explain the need for lubricants and factors influencing the engine lubrication, test fuels and lubricants to find various properties.
CO6: Demonstrate knowledge on recent developments of fuels and lubricants.

TEXT BOOKS:

1. B.P. Pundir, IC Engines – Combustion and Emissions, Narosa Publication, 2017.
2. S.S. Thipse, Alternative Fuels, JAICO Publishing House, 2010.

REFERENCE BOOKS:

1. EranSher ―Handbook of Air Pollution from Internal Combustion Engines-Pollutant Formation and Control, Academic Press, 2011.
2. Matthew Harrison, Vehicle refinement: controlling noise and vibration in road vehicles, Elsevier, Indian Edition, 2011.
3. Marco P Nuti, ―Emissions from two stroke engines, SAE Publication, 1998.
4. Sarkar, S., ―Fuels And Combustion‖, Oriented Longmann Press, 1990.

COs	POs												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	3	-	1	1	-	-	2	-	-	-	-	1	3	-	-
2	3	-	1	1	-	-	2	-	-	-	-	1	3	-	-
3	3	-	1	1	-	-	2	-	-	-	-	1	3	-	-
4	3	-	1	1	-	-	2	-	-	-	-	1	3	-	-
5	3	-	1	1	-	-	2	-	-	-	-	1	3	-	-
6	3	-	1	2	-	-	2	-	-	-	-	1	3	-	-
Overall correlation	3	-	1	1	-	-	2	-	-	-	-	1	3	-	-

23AU321 COMPUTER AIDED DESIGN LABORATORY

L	T	P	C
0	0	4	2

COURSE OBJECTIVES:

- To make the students understand and interpret drawings of machine components
- To familiarize the students with Indian Standards on drawing practices and standard components
- To gain practical experience in handling 2D drafting and 3D modeling software systems.

UNIT I DRAWING STANDARDS & FITS AND TOLERANCES 12

Code of practice for Engineering Drawing, BIS specifications – Welding symbols, Riveted joints, Keys, Fasteners – Reference to hand book for the selection of standard components like bolts, Nuts, Screws, Keys etc. - Limits, Fits – Tolerancing of individual dimensions – Specification of Fits – Preparation of production drawings and reading of part and assembly drawings, basic principles of geometric dimensioning & tolerancing.

UNIT II INTRODUCTION TO 2D DRAFTING 12

Drawing, Editing, Dimensioning, Layering, Hatching, Block, Array, Detailing, Detailed drawing. - Bearings - Bush bearing, Plummer block -Valves - Safety and non-return valves.

UNIT III 3D GEOMETRIC MODELING AND ASSEMBLY 9+3

Sketcher - Datum planes – Protrusion – Holes - Part modeling – Extrusion – Revolve – Sweep – Loft – Blend – Fillet - Pattern – Chamfer - Round - Mirror – Section - Assembly • Couplings – Flange, Universal, Oldham's, Muff, Gear couplings • Joints – Knuckle, Gib & cotter, strap, sleeve & cotter joints • Engine parts – Piston, connecting rod, cross-head (vertical and horizontal), stuffing box, multi-plate clutch • Miscellaneous machine components – Screw jack, machine vice, tail stock, chuck, vane and gear pump.

TOTAL: 60 PERIODS

Note: 25% of assembly drawings must be done manually and remaining 75% of assembly drawings must be done by using any CAD software. The above tasks can be performed manually and using standard commercial 2D / 3D CAD software

COURSE OUTCOMES:

At the end of the course, students will be able to

CO1: Follow the drawing standards, Fits and Tolerances.
CO2: Re-create part drawings, sectional views and assembly drawings as per standards.
CO3: Prepare standard drawing layout for modelled parts.
CO4: Model orthogonal views of machine components.
CO5: Prepare standard drawing layout for modelled assemblies with BoM.
CO6: Interpret the importance of GD&T.

TEXT BOOKS:

1. Radhakrishnan P, Subramanyan S. and Raju V., "CAD/CAM/CIM", 5th Edition, New Age International (P) Ltd, New Delhi,2023.
2. Mikell.P.Groover "Automation, Production Systems and Computer Integrated Manufacturing", Prentice Hall of India, 2008.

REFERENCE BOOKS:

1. N. D. Bhatt and V.M. Panchal, "Machine Drawing", 48th Edition, Charotar Publishers, 2013
2. Junnarkar, N.D., "Machine Drawing", 1st Edition, Pearson Education, 2004.
3. N. Siddeshwar, P. Kanniah, V.V.S. Sastri, "Machine Drawing" , published by Tata Mc GrawHill,2006.
4. S. Trymbaka Murthy, "A Text Book of Computer Aided Machine Drawing", CBS Publishers, New Delhi, 2007.

COs	POs												PSOs		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
1	2	1	2	2	3	1	1	2	2	2	3	3	2	1	2
2	1	1	1	2	3	1	1	2	2	2	3	3	1	1	1
3	1	1	3	2	3	1	1	2	2	2	3	3	1	1	3
4	1	1	1	2	3	1	1	2	2	2	3	3	1	1	1
5	1	1	2	2	3	1	1	2	2	2	3	3	1	1	2
6	1	1	2	2	3	1	1	2	2	2	3	3	1	1	2
Overall correlation	1	1	2	2	3	1	1	2	2	2	3	3	1	1	2

23AU322 AUTOMOTIVE ENGINES LABORATORY

L	T	P	C
0	0	4	2

COURSE OBJECTIVES:

- To associate various testing methodologies used in engine performance evaluation
- To analyze and interpret test data obtained from engine testing and emission measurement
- To display the regulatory framework governing engine emissions, including emission standards and testing protocols

LIST OF EXPERIMENTS:

1. Study of Engine Dynamometers.
2. Study of IC engine Pressure measurement systems for combustion analysis.
3. Performance study on petrol engine.
4. Performance study on diesel engine.
5. Determination of Frictional power on multi cylinder petrol/diesel engines.
6. Heat balance test on an automotive petrol/diesel engine.
7. Measurement of HC, CO, CO_2, O_2 and NOx using exhaust gas analyzer.
8. Diesel smoke measurement.

TOTAL: 60 PERIODS

COURSE OUTCOMES:

At the end of the course, students will be able to

CO1: Identify the various emission measuring instruments
CO2: Describe the various engine testing instruments.
CO3: Explain the procedure to measure the emission
CO4: Conduct testing for engine performance, combustion and emission characteristics.
CO5: Recall the available emission norms
CO6: Interpret data obtained from engine testing and emissions measurement

COs	POs												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	3	3	2	2	-	-	-	-	-	-	-	-	3	-	-
2	3	3	3	3	-	-	-	-	-	-	-	-	3	-	-
3	3	3	3	3	-	-	-	-	-	-	-	-	3	-	-
4	3	3	2	2	-	-	-	-	-	-	-	-	3	-	-
5	3	3	3	3	-	-	-	-	-	-	-	-	3	-	-
6	3	3	3	3	-	-	-	-	-	-	-	-	3	-	-
Overall correlation	3	3	3	3	-	-	-	-	-	-	-	-	3	-	-

23ES391 PRESENTATION SKILLS

L	T	P	C
0	0	2	1*

COURSE OBJECTIVES:

- To help learners use brainstorming techniques for generating, organizing and outlining ideas.
- To familiarize learners with different speech structures by engaging them in watching speeches with great opening and closing
- To give practice on voice modulation and use of body language and eye contact for making captivating presentations
- To give hands on training on preparing presentation slides and using remote presentation tools
- To train students on responding to question and feedback with confidence.

UNIT I BRAINSTORMING AND OUTLINING 6

Mind Mapping based on prior knowledge, collecting additional information from external resources, giving prompts to Generative AI tools seeking information, organizing ideas generated, knowing your audience

UNIT II STRUCTURING THE PRESENTATION 6

3 Ts of a presentation, writing effective introduction- Beginning the introduction with a hook (question, data, storytelling) and closing the introduction with the objective of the presentation. Structuring the body paragraphs -Choosing key ideas from the list of ideas generated during brainstorming. Substantiating ideas with examples, data, reasons and anecdotes. Summarizing the ideas for conclusion.

UNIT III DELIVERY TECHNIQUES 6

Vocal variety, intonation, reducing filler words and improving articulation, inflection, engaging the audience. Body language- eye contact, gestures, movement on stage.

UNIT IV USE OF TECHNOLOGICAL AIDS 6

Use of presentation software like MS Power Point, Google Slides etc, incorporating images, graphs, charts and videos, using interactive tools like quizzes and polls, using remote presentation tools like zoom, MS Teams, WebEx for screen sharing, virtual whiteboards and chat functionalities, incorporating AR/VR for more immersive presentations .

UNIT V HANDLING QUESTIONS AND FEEDBACK 6

Audience engagement through questions, PAR (Point, Answer, Redirect) strategy for structuring responses to questions. Understanding feedback process - Receiving, interpreting and evaluating constructively, active listening techniques for processing feedback, responding to feedback- acknowledging, clarifying and appreciating, Dealing with challenging feedback.

TOTAL: 30 PERIODS

COURSE OUTCOMES:

After completion of the course, the students should be able to

CO1 construct ideas for presentation through mind mapping techniques

CO2 organize ideas and structure the presentation with captivating introduction, body paragraphs illustrated with examples and reasons and compelling conclusion

CO3 apply vocal variety and body language techniques to enhance delivery

CO4 prepare engaging presentations by integrating multimedia elements

CO5 demonstrate proficiency in delivering presentations in remote platforms utilizing various technological tools and strategies to engage audience in virtual environments

CO6 exhibit active listening skills by responding to questions with clarity and confidence and incorporating constructive feedback for professional development

TEXT BOOKS:

1. "Slide:ology: The Art and Science of Creating Great Presentations" by Nancy Duarte. O'Reilly Media
2. "The Naked Presenter: Delivering Powerful Presentations With or Without Slides" by Garr Reynolds. New Riders

REFERENCE BOOK:

Talk Like TED: The 9 Public-Speaking Secrets of the World's Top Minds" by Carmine Gallo.

23MA401 OPTIMIZATION TECHNIQUES

L	T	P	C
3	1	0	4

COURSE OBJECTIVES:

- Formulate and solve linear programming problems (LPP)
- Evaluate Transportation and Assignment Problems
- Obtain solution to network problems using CPM and PERT techniques.
- Optimize the function subject to the constraints

UNIT I LINEAR PROGRAMMING MODELS 9+3

Introduction of Operations Research - mathematical formulation of LPP-Graphical Methods to solve LPP- Simplex Method- Big M method , Two phase method

UNIT II TRANSPORTATION PROBLEMS AND ASSIGNMENT PROBLEMS 9+3

Transportation problem (TP) - finding basic feasible solution of TP using North-West Corner Rule, Least Cost and Vogel's Approximation Method - MODI method for finding optimal solution for TP - Assignment problem - Hungarian method for solving Assignment problem - Travelling salesman problem as assignment problem – Production Scheduling problem – Introduction, Problems in single machine scheduling

UNIT III INVENTORY CONTROL 9+3

Introduction, Models – Problems in Purchase and Production (Manufacturing) models with and without shortages – Theory on types of inventory control systems: P& Q, ABC, VED, FNS, XYZ, SDE and HML.

UNIT IV PROJECT MANAGEMENT 9+3

Project definition - Gantt chart - Project network - Diagram representation – Floats - Critical path method (CPM) – PERT- Cost considerations in PERT and CPM

UNIT V CLASSICAL OPTIMIZATION THEORY 9+3

Unconstrained problems – necessary and sufficient conditions - Newton-Raphson method, Constrained problems – equality constraints – inequality constraints - Kuhn-Tucker conditions.

TOTAL: 60 PERIODS

COURSE OUTCOMES:

At the end of the course the students will be able to

CO 1 Formulate and solve linear programming problems (LPP)

CO 2 Examine Transportation Problems

CO 3 Examine Assignment Problems

CO 4 Plan the purchase/ manufacturing policies to meet customer Demands

CO 5 Obtain solution to network problems using CPM and PERT Techniques.

CO 6 Optimize the function subject to the constraints.

TEXT BOOKS:

1. Hamdy A Taha, Operations Research: An Introduction, Pearson, 10th Edition, 2017
2. R. Pannerselvan, Operations Research, 2nd Edition, PHI Publications, 2006

REFERENCE BOOKS:

1. Dontzig G.B, Linear Programming and extensions, Princeton University Press
2. ND Vohra, Quantitative Techniques in Management, Tata McGraw Hill, 4th Edition, 2011.
3. J. K. Sharma, Operations Research Theory and Applications, Macmillan, 5th Edition, 2012

COs	POs												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	3	3	2	1	-	-	-	-	-	-	1	2	1	-	-
2	3	3	2	1	-	-	-	-	-	-	1	2	1	-	-
3	3	3	2	1	-	-	-	-	-	-	1	2	1	-	-
4	3	3	2	1	-	-	-	-	-	-	1	2	1	-	-
5	3	3	2	1	-	-	-	-	-	-	1	2	1	-	-
6	3	3	2	1	-	-	-	-	-	-	1	2	1	-	-
Overall correlation	3	3	2	1	-	-	-	-	-	-	1	2	1	-	-

23AU401 AUTOMOTIVE TRANSMISSION

L	T	P	C
3	0	0	3

COURSE OBJECTIVES:

- To study the need and types of clutch and gearbox.
- To make the students understand the basic construction and working of hydrodynamic transmission systems and epicyclic gear.
- To make the students realize the importance of hydrostatic and electric drives

UNIT I CLUTCH AND GEAR BOX **9**

Requirement of transmission system, Different types of clutches, Principle & Construction of single plate coil spring and diaphragm spring clutches, Need and objectives of Gear box. Construction and operation of sliding mesh, Constant mesh and Synchromesh gearboxes. – Determination of gear ratios for vehicles. Performance of automobile such as resistance to motion, Tractive effort, Engine speed, Power and acceleration.

UNIT II HYDRODYNAMIC TRANSMISSION **9**

Fluid coupling – Principle - Constructional details. Torque capacity. Performance characteristics. Reduction of drag torque in fluid coupling. Torque Converter – Principle - Constructional details, Performance characteristics. Multistage torque converters and Polyphase torque converters.

UNIT III EPICYCLIC GEARBOXES USED IN AUTOMATIC TRANSMISSION **9**

Principle of planetary gear trains - Wilson Gear box, Simpson planetary gear train, Cotal electromagnetic transmission - Hydraulic control system for Automatic Transmission.

UNIT IV AUTOMATIC TRANSMISSION APPLICATIONS **9**

Automated Manual Transmission (AMT) - Need for automatic transmission, Four speed longitudinally mounted automatic transmission – Chevrolet - Turboglide‖ Transmission, Continuously Variable Transmission (CVT) – Types – Operations of a typical CVT.

UNIT V HYDROSTATIC AND ELECTRIC DRIVE **9**

Principles of Hydrostatic drive, Various types of hydrostatic systems. Advantages and limitations. Comparison of hydrostatic drive with hydrodynamic drive, Construction and working of typical Janny hydrostatic drive. Electric drive – types - Principle of early and modified Ward Leonard Control system - Advantages & limitations. Modern Electric drive.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

At the end of the course the students will be able to

CO1: Describe the needs, types of gearbox and clutch.
CO2: Explain the construction and working of hydrodynamic transmission system.
CO3: Comprehend the working of epicyclic gear train in transmission systems.
CO4: Explain the working principle and applications of automatic transmission.
CO5: Compute the principles of hydrostatic and electric drives
CO6: Demonstrate knowledge on recent developments of various transmission.

TEXT BOOKS:

1. GarrettT.K., New ton. K., Steeds.W., ―The Motor Vehicle Published: Butterworth Heinemann,13th Edition-2000.
2. Devaradjane. Dr. G., Kumaresan. Dr. M., ―Automobile Engineering, AMK Publishers, 2013.

REFERENCE BOOKS:

1. JackErkavec, Automotive Technology-A Systems approach, Cengage learning, Delmar, 2010.
2. Judge.A.W., Modern Transmission System, Chapman and Hall Ltd, 2000.
3. Heinz Hesiler, Advanced engine technology. Butterworth Heinmann publications, 2011.
4. Heldt, P.M., High-Speed Combustion Engines, Oxford IBH Publishing Co., Calcutta.

COs	**POs**												**PSOs**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
1	3	3	3	1	-	-	-	-	-	-	-	-	2	-	2
2	3	3	3	1	-	-	-	-	-	-	-	-	2	-	2
3	3	3	3	1	-	-	-	-	-	-	-	-	3	-	2
4	3	3	3	1	-	-	-	-	-	-	-	2	3	-	-
5	3	3	3	1	-	-	-	-	-	-	-	2	3	-	-
6	3	3	3	1	-	-	-	-	-	-	-	2	3	-	-
Overall correlation	3	3	3	1	-	-	-	-	-	-	-	2	3	-	2

23AU402	AUTOMOTIVE ELECTRICAL AND ELECTRONICS ENGINEERNIG	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To provide students with a comprehensive understanding of vehicle electrical systems, including electrical circuits, power supply, and battery fundamentals.
- To provide students with a deep understanding of alternators, starter motors and automotive lighting technology in automotive applications.
- To provide students with a comprehensive understanding of automotive electronics, sensors, actuators, and vehicle networking.

UNIT I INTRODUCTION AND AUTOMOTIVE BATTERIES 9

Introduction - Overview of vehicle electrical systems- Electrical circuits - Electrical power supply in conventional vehicle- Dimensioning of wires- Circuit diagrams and symbols - Electromagnetic Compatibility and interference suppression. Batteries – Battery design – Method of operation – Lead acid battery construction – Battery ratings and testing- Maintenance -Free batteries.

UNIT II STARTING AND CHARGING SYSTEM 9

Alternators – Generation of electrical energy in vehicle- Physical principles- Alternator and voltage regulations versions – Power losses – Characteristics curve- Alternator operation in the vehicle- Alternator circuitry. Starter Motors – Development and Starting requirements in the IC engines- Starter motor design – Starter motor control and power circuits.

UNIT III LIGHTING AND AUXILLARY SYSTEM 9

Automotive lighting technology – Technical demands – Development of lighting technology- Light sources – Physical principles – Front and rear lighting system- Interior lighting system – Special purpose lamps – Adaptive Lighting system - Instrument clusters - Wiper and washer systems- Electric horns.

UNIT IV AUTOMOTIVE ELECTRONICS AND SENSORS AND ACTUATOR 9

Automotive Electronics - Overview and demands - Basic principles of semiconductor technology - Electronic Components - semiconductor components - Microcontrollers - Sensor - Signal Processing - Data Processing in the vehicle - Glossary for automotive microelectronics. Automotive Sensors – Basics – Sensors : Position, Speed, Acceleration / Vibrational, Force / Torque, Flow meters, Gas / Concentration, Temperature- Measured Quantities, Measuring Principles and automotive applications. Automotive Actuators - Electromechanical actuators- Fluid-mechanical actuators.

UNIT V VEHICLE NETWORKING 9

Data transfer between automotive electronics systems - Basic principles of networking- Network topology- Network organization- OSI reference model- Control mechanisms - Communication protocols in embedded systems- - Vehicle Communication Protocols – Cross-system functions - Requirements for bus systems- Classification of bus systems- Applications in the vehicle - Coupling of networks- Examples of networked Vehicles - Bus system- CAN, LIN, Flexray – MOST etc.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

At the end of the course the students will be able to

CO1: Illustrate the construction of Automotive Batteries and its charging system.

CO2: Identify the mechanism of starter motor, and describe the working of starter motor and alternator in the vehicle.

CO3: Construct the circuit connections of electronic injection and lighting of different electrical systems in automobile.

CO4: Identify the need of various Sensors and Actuators in automobiles.

CO5: Develop basic data processing in microprocessors.

CO6: Explain the various Vehicle Communication Protocols in automobile.

TEXT BOOKS:

1. Bosch Automotive Electrics and Automotive Electronics Systems and Components, Networking and Hybrid Drive, 5th Edition, 2007.
2. S.V. Dishore, " Automotive Electrical and Electronics", Lakshmi Publications, Chennai, 2019.

REFERENCE BOOKS:

1. James D Halderman, “Automotive Electrical and Electronics”, Prentice Hall, USA, 2013.
2. Tom Denton, “Automotive Electrical and Electronics Systems,” Third Edition, SAE International, 2004.
3. William Ribbens, "Understanding Automotive Electronics - An Engineering Perspective”, 7th Edition, Elsevier Butterworth-Heinemann Publishers, 2012.
4. Barry Holembeak, “Automotive Electrical and Electronics”, Delmar Publishers, Clifton Park, USA, 2010.

COs	POs												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	1	1	2	3	1	2	2	-	1	1	-	2	-	1	3
2	1	1	2	3	1	2	2	-	1	1	-	2	-	1	3
3	1	1	2	3	1	2	2	-	1	1	-	2	-	1	3
4	1	1	2	3	1	2	2	-	1	1	-	2	-	1	3
5	1	1	2	3	1	2	2	-	1	1	-	2	-	1	3
6	1	1	2	3	1	2	2	-	1	1	-	2	-	1	3
Overall correlation	1	1	2	3	1	2	2	-	1	1	-	2	-	1	3

23CE412 STRENGTH OF MATERIALS

L	T	P	C
3	0	2	4

COURSE OBJECTIVES:

- To understand the concepts of stress, strain, principal stresses and principal planes.
- To study the concept of shearing force and bending moment due to external loads in determinate beams and their effect on stresses.
- To determine stresses and deformation in circular shafts and helical spring due to torsion.
- To compute slopes and deflections in determinate beams by various methods.
- To study the stresses and deformations induced in thin and thick shells.

UNIT I STRESS, STRAIN AND DEFORMATION OF SOLIDS 9+6

Rigid bodies and deformable solids – Tension, Compression and Shear Stresses – Deformation of simple and compound bars – Thermal stresses – Elastic constants, Poisson's ratio – Volumetric strains – Stresses on inclined planes – principal stresses and principal planes – Mohr's circle for plane stress.

UNIT II TRANSVERSE LOADING ON BEAMS AND STRESSES IN BEAMS 9+6

Beams – types transverse loading on beams – Shear force and bending moment in beams – Cantilevers – Simply supported beams and over – hanging beams. Theory of simple bending– bending stress distribution – Load carrying capacity – Proportioning of sections– Shear stress distribution.

UNIT III DEFLECTION OF BEAMS 9+6

Double Integration method – Macaulay's method – Area moment method- Conjugate beam method for computation of slopes and deflections in determinate beams.

UNIT IV TORSION, SPRINGS AND COLUMNS 9+6

Theory of Torsion - Stresses and deformations in solid and hollow circular shafts – Stepped shafts – Power transmitted by a shaft.
Helical springs – Differences between closely coiled and open coiled helical springs – Closely coiled helical springs – Calculation of shear stress, deflection and stiffness.
Columns – Euler's theory – Calculation of crippling load for different end conditions for a long column.

UNIT V THIN CYLINDERS, SPHERES AND THICK CYLINDERS 9+6

Stresses in thin and thick cylindrical shell, deformation in thin and thick cylinders – spherical shells subjected to internal pressure –Deformation in spherical shells.

LIST OF EXPERIMENTS

1. Tension test on mild steel rod
2. Double shear test on mild steel rod
3. Torsion test on mild steel rod
4. Izod Impact test on metal specimen
5. Charpy Impact test on metal specimen
6. Rockwell Hardness test on metals
7. Brinell Hardness test on metals
8. Compression test on helical spring.
9. Heat Treatment Processes- Annealing, Normalizing, Quenching and Tempering
10. Jominy End Quench Test

TOTAL: 45 + 30 PERIODS

COURSE OUTCOMES:

At the end of the course the students will be able to

CO1: Calculate the different stresses developed in the solids when subjected to different loading conditions.

CO2: Interpret the shear force and bending moment diagrams of the beams under the various loading conditions.

CO3: Examine the bending stress and shear stress distribution of various sections of the beam.

CO4: Calculate the slope and deflection of beams using different methods.

CO5: Apply the basic equations to design shafts, springs and columns.

CO6: Calculate the stresses developed in the thin cylinder, thick cylinder, and spherical shells.

TEXT BOOKS:

1. Bansal, R.K., "Strength of Materials", Laxmi Publications (P) Ltd., 2016
2. Rattan S.S., "Strength of Materials", Tata McGraw Hill Education Pvt. Ltd., New Delhi, 2017.

REFERENCE BOOKS:

1. Rajput R.K. "Strength of Materials (Mechanics of Solids)", S.Chand & company Ltd., New Delhi, 7th edition, 2018.
2. Egor P Popov, "Engineering Mechanics of Solids", 2nd edition, PHI Learning Pvt. Ltd., New Delhi, 2015.
3. Beer. F.P. & Johnston. E.R. "Mechanics of Materials", Tata McGraw Hill, 8th Edition, New Delhi 2019.

4. Subramanian R., "Strength of Materials", Oxford University Press, Oxford Higher Education Series, 2010.

COs	POs												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	3	2	1	1	1	1	-	-	2	-	-	-	3	1	-
2	3	2	1	1	1	1	-	-	2	-	-	-	3	1	-
3	3	2	1	1	1	1	-	-	2	-	-	-	3	1	-
4	3	2	1	1	1	1	-	-	2	-	-	-	3	1	-
5	3	2	1	1	1	1	-	-	2	-	-	-	3	1	-
6	3	2	1	1	1	1	-	-	2	-	-	-	3	1	-
Overall correlation	3	2	1	1	1	1	-	-	2	-	-	-	3	1	-

23AU421 AUTOMOTIVE COMPONENTS LABORATORY

L	T	P	C
0	0	4	2

COURSE OBJECTIVES:

- To experience the skill of dismantling and assembling of engines and to optimize the combustion process in SI and CI engines.
- To understand the requirements of fuel systems in automobile vehicle.
- To understand the mounting of components, the basic working principle of components with the engine for accurate operations.

LIST OF EXPERIMENTS :

1. Dismantling and assembling of Multi-cylinder Petrol Engine.
2. Dismantling and assembling of Multi-cylinder Diesel Engine.
3. Dismantling and assembling of Transfer case.
4. Study of chassis layouts and Measurement of light Vehicle Frame.
5. Exercise on dismantling and assembling of front, rear axles, and determination of differential gear ratio.
6. Exercise on brake adjustment and brake bleeding of braking system.
7. Dismantling, Measurement and Assembling of Single plate, Diaphragm Clutch.
8. Exercise on dismantling and determining the gear ratio of synchromesh gear box.
9. Measurement of steering ratio, steering angle, and turning radius of steering system.
10. Dismantling and assembling of suspension system.

TOTAL : 60 PERIODS

COURSE OUTCOMES:

At the end of the course the students will be able to

CO1: Select the type of automobile engine based on construction, shape and application.

CO2: Compare petrol and diesel fuel supply systems in modern automobiles.

CO3: Explain the procedure for dismantling differential and clutch in vehicles.

CO4: Demonstrate front and rear axles and steering systems.

CO5: Select the suitable gear box and determine the gear ratio for automobile vehicles.

CO6: Demonstrate knowledge on recent developments of transmission systems.

COs	POs												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	-	-	2	2	3	-	-	-	-	-	-	1	2	-	-
2	-	-	1	2	3	-	-	-	-	-	-	-	-	-	-
3	3	-	2	2	3	-	-	-	-	-	-	1	3	-	-
4	-	-	1	2	3	-	-	-	-	-	-	-	-	-	-
5	-	-	1	2	3	-	-	-	-	-	-	-	3	-	-
6	-		1	2	3										
Overall correlation	3	-	1	2	3	-	-	-	-	-	-	1	3	-	-

23AU422	**AUTOMOTIVE ELECTRICAL AND ELECTRONICS ENGINEERING LABORATORY**	**L**	**T**	**P**	**C**
		0	**0**	**4**	**2**

COURSE OBJECTIVES:

- To understand the principles, components, and functions of vehicle lighting systems, including headlights, taillights, turn signals, and interior lighting, and their significance for safety and visibility.
- To provide students with a comprehensive understanding and practical skills in utilizing electronic instrumentation and microcontroller programming techniques for automotive applications.
- To develop proficiency in designing, implementing, and troubleshooting electronic systems essential for automotive diagnostics and control.

LIST OF EXPERIMENTS :

Electrical System

1. Study of Vehicle lighting system.
2. Study of an Ignition system.
3. Study of Layout of an Automotive Electrical System.
4. Study of Voltage regulator, solenoids, Horn and wiper mechanism.
5. Testing of Battery – Hydrometer, Individual Cell voltage test.
6. Testing of Starter Motor – Load test.
7. Testing of Alternator – Load test.

Electronic System

1. Visualization of Engine Sensor Signals and fault Diagnosis using OBD Kit.
2. Interface of Seven segment display.
3. Interfacing of ADC for a sensor and Interfacing of DAC for an actuator.
4. Interface circuit like amplifier, filter, Multiplexer and De Multiplexer.
5. Basic microprocessor programming like arithmetic and Logic operation, code conversion, look up table etc.
6. Programming in microcontroller.
7. Study of Virtual Instrumentation and Communication Protocols (CAN, LIN, MOST).

TOTAL : 60 PERIODS

COURSE OUTCOMES:

At the end of the course the students will be able to

CO1: Explain the working principle of Electrical circuits in automobile.
CO2: Describe the working principle of Ignition system.
CO3: Evaluate the working principle of Battery, and starter motor.
CO4: Describe the working principle of auxiliary systems used in automobiles.
CO5: Explain the use of sensors in an automobile.
CO6: Develop programming knowledge on Microprocessor

COs	POs												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	1	1	2	3	1	2	2	-	1	1	-	2	-	1	3
2	1	1	2	3	1	2	2	-	1	1	-	2	-	1	3
3	1	1	2	3	1	2	2	-	1	1	-	2	-	1	3
4	1	1	2	3	1	2	2	-	1	1	-	2	-	1	3
5	1	1	2	3	1	2	2	-	1	1	-	2	-	1	3
6	1	1	2	3	1	2	2	-	1	1	-	2	-	1	3
Overall correlation	1	1	2	3	1	2	2	-	1	1	-	2	-	1	3

23ES491 APTITUDE AND LOGICAL REASONING –I

L	T	P	C
0	0	2	1

COURSE OBJECTIVES:

- To improve the problem solving and logical thinking ability of the students.
- To acquaint student with frequently asked questions and patterns in quantitative aptitude and logical reasoning.

UNIT I **4**

Numbers, LCM, HCF, Averages, Ratio & Proportion, Mixtures & Allegation.

UNIT II **4**

Percentages, Time and work, Pipes and Cistern, coding and decoding.

UNIT III **4**

Time Speed Distance, Train, Boats and Streams, Analogy.

UNIT IV **4**

Data Interpretation(BAR,PIE,LINE), Seating arrangement.

UNIT V **4**

Simple Interest and Compound Interest, Profit loss and Discount, Partnership,

TOTAL: 20 PERIODS

COURSE OUTCOMES:

At the end of the course the students will be able to

CO 1 Understand the basic concepts of quantitative ability

CO 2 Understand the basic concepts of logical reasoning Skills

CO 3 Increase in critical thinking skills

CO 4 Able to solve campus placements aptitude papers covering Quantitative Ability, Logical Reasoning Ability

TEXT BOOK:

APTIPEDIA, 2nd edition, Wiley Publishers

REFERENCE BOOKS:

1. Quantitative Aptitude – R.S. Agarwal
2. A Modern Approach To Verbal & Non-Verbal Reasoning By R S Agarwal

KCG COLLEGE OF TECHNOLOGY (AUTONOMOUS)
REGULATIONS 2023
B.E. COMPUTER SCIENCE AND ENGINEERING
CHOICE BASED CREDIT SYSTEM
CURRICULA FOR SEMESTERS I TO VIII

SEMESTER – I

SL. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
	23IP101	Induction Programme		-	-	-	-	-
		THEORY						
1	23HS101	Essential Communication	HSMC	3	0	0	3	3
2	23MA101	Matrices and Calculus	BSC	3	0	0	3	3
3	23CS101	Programming in C	ESC	3	0	0	3	3
4	23HS102	Heritage of Tamils	HSMC	1	0	0	1	1
		THEORY AND PRACTICALS						
5	23PH111	Engineering Physics	BSC	3	0	2	5	4
6	23CY111	Engineering Chemistry	BSC	3	0	2	5	4
		PRACTICALS						
7	23CS121	C Programming Laboratory	ESC	0	0	4	4	2
8	23HS121	Communication Skills Laboratory	HSMC	0	0	2	2	1
9	23CS122	Computational Thinking	ESC	0	0	2	2	1
10	23HS122	General Clubs / Technical Clubs / NCC / NSS / Extension Activities	HSMC	0	0	2	2	1*
			TOTAL	**16**	**0**	**14**	**30**	**22**

*** The grades earned by the students will be recorded in the Mark Sheet, however the same shall not be considered for the computation of CGPA**

SEMESTER – II

SL. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
		THEORY						
1	23HS201/ 23HS202	Professional English / Foreign Language	HSMC	3	0	0	3	3
2	23MA204	Probability and Statistics	BSC	3	1	0	4	4
3	23PH205	Physics for Information Science	BSC	3	0	0	3	3
4	23CS201	Data Structures using C	PCC	3	0	0	3	3
5	23HS203	Tamils & Technology	HSMC	1	0	0	1	1
		THEORY AND PRACTICALS						
6	23EE281	Basic Electrical and Electronics Engineering	ESC	2	0	2	4	3
7	23ME211	Engineering Graphics	ESC	3	0	2	5	4
		PRACTICALS						
8	23ME221	Engineering Practices Laboratory	ESC	0	0	4	4	2
9	23CS221	Data Structures Using C Laboratory	PCC	0	0	4	4	2
10	23ES291	Soft Skills	EEC	0	0	2	2	1*
			TOTAL	**18**	**1**	**14**	**33**	**25**

SEMESTER III

SL. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
THEORY								
1	23MA202	Discrete Mathematics	BSC	3	1	0	4	4
2	23CS301	Object Oriented Programming	PCC	3	0	0	3	3
3	23CS302	Database Management Systems	PCC	3	0	0	3	3
4	23HS301	Universal Human Values and Ethics	HSMC	3	0	0	3	3
THEORY AND PRACTICALS								
5	23CS311	Digital Principles and System Design	PCC	3	0	2	5	4
6	23CS312	Design and Analysis of Algorithms	PCC	3	0	2	5	4
PRACTICALS								
7	23CS321	Object Oriented Programming Laboratory	PCC	0	0	4	4	2
8	23CS322	Database Management Systems Laboratory	PCC	0	0	4	4	2
9	23ES391	Presentation Skills	EEC	0	0	2	2	1*
TOTAL				**18**	**1**	**14**	**33**	**25**

SEMESTER IV

SL. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
THEORY								
1	23MA301	Linear Algebra	BSC	3	1	0	4	4
2	23CS401	Operating Systems	PCC	3	0	0	3	3
3	23CS402	Artificial Intelligence	PCC	3	0	0	3	3
4	23CS403	Theory of Computation	PCC	3	0	0	3	3
5	23CS404	Computer Architecture	PCC	3	0	0	3	3
THEORY AND PRACTICALS								
6	23CS411	Software Engineering	PCC	3	0	2	5	4
PRACTICALS								
7	23CS421	Operating Systems Laboratory	PCC	0	0	4	4	2
8	23CS422	Artificial Intelligence Laboratory	PCC	0	0	4	4	2
9	23ES491	Aptitude and Logical Reasoning – 1	EEC	0	0	2	2	1*
10	23CS423	Mini Project – 1	EEC	0	0	2	2	1
TOTAL				**18**	**1**	**14**	**33**	**25**

SEMESTER V

SL. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
THEORY								
1	23RE501	Research Methodology and Intellectual Property Rights	ESC	2	0	0	2	2
2	23CS501	Computer Networks	PCC	3	0	0	3	3
3		Department Elective – 1	DEC	3	0	0	3	3
4		Department Elective – 2	DEC	3	0	0	3	3
5		Non Department Elective – 1 (Emerging Technology)	NEC	3	0	0	3	3
THEORY AND PRACTICALS								
6	23CS511	Compiler Design	PCC	3	0	2	5	4
PRACTICALS								
7	23CS521	Computer Networks Lab	PCC	0	0	4	4	2
8	23CS522	Mini Project – 2	EEC	0	0	4	4	2
9	23ES591	Aptitude and Logical Reasoning - 2	EEC	0	0	2	2	1*
TOTAL				**17**	**0**	**12**	**29**	**22**

SEMESTER VI

SL. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
THEORY								
1	23CS601	Cyber Security	PCC	3	0	0	3	3
2		Department Elective - 3	DEC	3	0	0	3	3
3		Department Elective - 4	DEC	3	0	0	3	3
4		Non-Department Elective – 2 (Management / Safety Courses)	NEC	3	0	0	3	3
THEORY AND PRACTICALS								
5	23CE611	Environmental Sciences and Engineering	ESC	3	0	2	5	4
6	23CS611	Internet Programming	PCC	3	0	2	5	4
PRACTICALS								
7	23CS621	Project Work - Phase 1	EEC	0	0	4	4	2
8	23CS622	Technical Training	EEC	0	0	2	2	1
9	23CS623	Technical Seminar – 1	ESC	0	0	2	2	1
TOTAL				**18**	**0**	**12**	**30**	**24**

SEMESTER VII

SL. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
THEORY								
1		Non-Department Elective - 3 (Management Courses)	NEC	3	0	0	3	3
2		Department Elective - 5	DEC	3	0	0	3	3
3		Department Elective - 6	DEC	3	0	0	3	3
4	23CS701	Comprehension	EEC	2	0	0	2	2
THEORY AND PRACTICALS								
5	23CS711	Machine Learning and its Applications	PCC	3	0	2	5	4
PRACTICALS								
6	23CS721	Project Work - Phase 2	EEC	0	0	6	6	3
7	23CS722	Technical Seminar – 2	ESC	0	0	4	4	2
TOTAL				**14**	**0**	**12**	**26**	**20**

SEMESTER VIII

SL. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
PRACTICALS								
1	23CS821/ 23CS822	Internship / Capstone Project	EEC	0	0	20	20	10
TOTAL				0	0	20	20	10

TOTAL CREDITS: 173

DEPARTMENT ELECTIVE COURSES

VERTICAL 1: CLOUD COMPUTING

SL. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1	23IT031	Distributed and Cloud Computing	DEC	2	0	2	4	3
2	23IT032	Cloud ServicesManagement	DEC	2	0	2	4	3
3	23IT033	Virtualization	DEC	2	0	2	4	3
4	23IT034	Cloud Database Management	DEC	2	0	2	4	3
5	23IT035	Storage Technologies	DEC	2	0	2	4	3
6	23IT036	Security and Privacy in Cloud	DEC	2	0	2	4	3
7	23IT037	Stream Processing	DEC	2	0	2	4	3
8	23IT038	GDP and Cloud Web Services	DEC	2	0	2	4	3

VERTICAL 2: FULL STACK DEVELOPMENT

SL. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1	23CS031	Java Full Stack Development	DEC	2	0	2	4	3
2	23CS032	Mobile App Development	DEC	2	0	2	4	3
3	23CS033	UI and UX Design	DEC	2	0	2	4	3
4	23CS034	MERN Stack Web Development	DEC	2	0	2	4	3
5	23CS035	DevOps	DEC	2	0	2	4	3
6	23CS036	Cognitive Systems	DEC	2	0	2	4	3
7	23CS037	Advanced Java Programming	DEC	2	0	2	4	3
8	23CS038	Python Full Stack Development	DEC	2	0	2	4	3

VERTICAL 3: ARTIFICIAL INTELLIGENCE AND DATA SCIENCE

SL. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1	23IT039	KnowledgeEngineering	DEC	3	0	0	3	3
2	23IT040	Introduction to Data Science	DEC	3	0	0	3	3
3	23IT041	Neural Networks and Deep Learning	DEC	3	0	0	3	3
4	23IT042	Natural Language Processing in AI	DEC	3	0	0	3	3
5	23IT043	Principle practices of AI	DEC	3	0	0	3	3
6	23IT044	Big Data Analytics	DEC	3	0	0	3	3
7	23IT045	Data Mining and Warehousing	DEC	3	0	0	3	3
8	23AD049	Ethics of AI	DEC	3	0	0	3	3

ELECTIVE 4: NETWORK & SECURITY

SL. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1	23CB031	Ethical Hacking	DEC	3	0	0	3	3
2	23CB032	Digital and Mobile Forensics	DEC	3	0	0	3	3
3	23CB033	Social Network Security	DEC	3	0	0	3	3
4	23CS039	Information Security	DEC	3	0	0	3	3
5	23CS040	High Performance Networks	DEC	3	0	0	3	3
6	23CS041	Crypto currency and Blockchain Technology	DEC	3	0	0	3	3
7	23CS042	Protocols and Architectures for Wireless Sensor Networks	DEC	3	0	0	3	3
8	23CS043	Mobile and Pervasive Computing	DEC	3	0	0	3	3

VERTICAL 5: EMERGING TECHNOLOGIES

SL. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1	23CS044	AR VR Technology	DEC	2	0	2	4	3
2	23CS045	Quantum Computing	DEC	2	0	2	4	3
3	23CS041	Cryptocurrency and Blockchain Technology	DEC	2	0	2	4	3
4	23CS046	Game Development	DEC	2	0	2	4	3
5	23CS033	UI and UX Design	DEC	2	0	2	4	3
6	23CS047	Internet of Things	DEC	2	0	2	4	3
7	23CS048	Computer Vision and Applications	DEC	2	0	2	4	3
8	23AD047	Robotic Process Automation	DEC	2	0	2	4	3

NON-DEPARMENT ELECTIVE

EMERGING TECHNOLOGY

SL NO	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1	23NE975	IoT concepts and applications	NEC	3	0	0	3	3
2	23NE980	Renewable Energy Systems	NEC	3	0	0	3	3
3	23NE982	Resource Management Techniques	NEC	3	0	0	3	3
4	23NE983	Aviation Management	NEC	3	0	0	3	3
5	23NE986	Foundation of Robotics	NEC	3	0	0	3	3
6	23NE987	Space Engineering	NEC	3	0	0	3	3
7	23NE988	Electric and Hybrid Vehicles	NEC	3	0	0	3	3
8	23NE989	Wearable Devices	NEC	3	0	0	3	3

MANAGEMENT COURSES

SL NO	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1	23HS971	Total Quality Management	NEC	3	0	0	3	3
2	23HS972	Engineering Economics and Financial Accounting	NEC	3	0	0	3	3
3	23HS973	Engineering Management and Law	NEC	3	0	0	3	3
4	23HS974	Knowledge Management	NEC	3	0	0	3	3
5	23HS975	Industrial Management	NEC	3	0	0	3	3
6	23HS976	Entrepreneurship and Business Opportunities	NEC	3	0	0	3	3
7	23HS977	Modern Business Administration and Financing	NEC	3	0	0	3	3
8	23HS978	Essentials of Management	NEC	3	0	0	3	3

SAFETY COURSES

SL NO	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1	23HS979	Disaster Management	NEC	3	0	0	3	3
2	23HS980	Industrial Safety	NEC	3	0	0	3	3
3	23HS981	Automotive Safety	NEC	3	0	0	3	3

SEMESTER-WISE CREDIT DISTRIBUTION

SEMESTER	HSMC	BSC	ESC	PCC	DEC	NEC	EEC	TOTAL
Semester I	**5+1***	**11**	**6**					**22**
Semester II	**4**	**7**	**9**	**5**			**1***	**25**
Semester III	**3**	**4**	**0**	**18**			**1***	**25**
Semester IV		**4**		**20**			**1+1***	**25**
Semester V			**2**	**9**	**6**	**3**	**2+1***	**22**
Semester VI			**5**	**7**	**6**	**3**	**3**	**24**
Semester VII			**2**	**4**	**6**	**3**	**5**	**20**
Semester VIII							**10**	**10**
TOTAL	**12**	**26**	**24**	**63**	**18**	**9**	**21**	**173**

23MA202 DISCRETE MATHEMATICS

L	T	P	C
3	1	0	4

COURSE OBJECTIVES:

- To develop student‘s logical and mathematical maturity and ability to deal with abstraction.
- To introduce most of the basic terminologies used in computer science related courses and application of ideas to solve practical problems.
- To understand the basic concepts of combinatorics and graph theory.
- To familiarize the applications of algebraic structures.
- To understand the concepts and significance of Lattices and Boolean algebra which are widely used in computer science and engineering.

UNIT I LOGIC AND PROOFS 9+3

Propositional logic – Propositional equivalences - Predicates and quantifiers – Nested quantifiers – Rules of inference - Introduction to proofs – Proof methods and strategy

UNIT II COMBINATORICS 9+3

Mathematical induction - The basics of counting - Well ordering -Strong induction – The pigeonhole principle – Permutations and Combinations – Recurrence relations - Solving linear recurrence relations – Generating functions – Inclusion and exclusion principle and its applications.

UNIT III GRAPHS 9+3

Graphs and graph models – Graph terminology and special types of graphs – Matrix representation of graphs and graph isomorphism – Connectivity – Euler and Hamilton paths.

UNIT IV LATTICES AND BOOLEAN ALGEBRA 9+3

Algebraic systems – Semi groups and monoids - Groups – Subgroups – Homomorphism‘s – Normal subgroup and cosets – Lagrange‘s theorem – Definitions and examples of Rings and Fields.

UNIT V Z-TRANSFORMS AND DIFFERENCE EQUATIONS 9+3

Partial ordering – Posets – Lattices as posets – Properties of lattices - Lattices as algebraic systems – Sub lattices – Direct product and homomorphism – Some special lattices – Boolean algebra – Boolean Homomorphism.

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TOTAL: 60 PERIODS

COURSE OUTCOMES:

At the end of the course the students will be able to

CO1: Apply the concepts of propositional and predicate calculus to the given logical statements needed for computing skill

CO2: Apply the idea of mathematical induction, pigeon-hole principle, inclusion and exclusion principle, permutation and combinations, recurrence relations and generating functions in combinatorial problems

CO3: Analyze the solutions for various engineering problems using graphs

CO4: Apply the concepts and properties of algebraic structures such as semi groups, monoids and groups needed in areas like formal languages and design fast adders, error-detecting codes and error-correcting codes

CO5: Identify the lattice structure using its properties

CO6: Apply Boolean expressions in areas like computational theory.

TEXT BOOKS:

1. Rosen. K.H., "Discrete Mathematics and its Applications", 7th edition, Tata McGraw Hill Pub. Co. Ltd., New Delhi, Special Indian Edition, 2017.
2. Tremblay. J.P. and Manohar. R, "Discrete Mathematical Structures with Applications to Computer Science", Tata McGraw Hill Pub. Co. Ltd, New Delhi, 30th Reprint, 2011.

REFERENCE BOOKS:

1. Dr.P.Sivaramakrishnadas, Dr.C.Vijayakumari, 'Discrete Mathematics' Pearson Publications
2. Grimaldi. R.P. "Discrete and Combinatorial Mathematics: An Applied Introduction", 5thEdition, Pearson Education Asia, Delhi, 2013.
3. Koshy. T. "Discrete Mathematics with Applications", Elsevier Publications, 2006.
4. Lipschutz. S. and Mark Lipson., "Discrete Mathematics", Schaum's Outlines, Tata McGraw Hill Pub. Co. Ltd., New Delhi, 3rd Edition, 2010.

COs	POs												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	2	2	3	2	1	-	-	-	2	1	1	2	2	1	-
2	3	1	3	1	1	-	-	-	2	1	1-	2	3	1	-
3	3	2	3	2	1	-	-	-	2	1	1	2	3	1	-
4	1	2	2	2	-	-	-	-	2	1	1	1	1	-	-
5	1	1	2	2	-	-	-	-	1	1	-	1	1	-	-
6	2	1	3	2	1	-	-	-	-	1	-	2	2	1	-
Overall correlation	2	2	3	2	1	-	-	-	2	1	1	2	2	1	-

23CS301 OBJECT ORIENTED PROGRAMMING

L	T	P	C
3	0	0	3

COURSE OBJECTIVES:

- To understand Object Oriented Programming concepts and basics of Java Programming language
- To know the principles of packages, inheritance and interfaces
- To develop a Java application with threads and generics classes
- To define exceptions and use I/O streams
- To design and build Graphical User Interface Application using JAVAFX

UNIT I INTRODUCTION TO OOP AND JAVA 9

Overview of OOP – Object Oriented Programming paradigms – Features of Object Oriented Programming – Java Buzzwords – Overview of Java – Data Types, Variables and Arrays – Operators – Control Statements – Programming Structures in Java – Defining classes in Java – Constructors-Methods -Access specifiers - Static members- Java Doc comments

UNIT II INHERITANCE, PACKAGES AND INTERFACES 9

Overloading Methods – Objects as Parameters – Returning Objects –Static, Nested and Inner Classes. Inheritance: Basics– Types of Inheritance -Super keyword -Method Overriding – Dynamic Method Dispatch –Abstract Classes – final with Inheritance. Packages and Interfaces: Packages – Packages and Member Access –Importing Packages – Interfaces.

UNIT III EXCEPTION HANDLING AND MULTITHREADING 9

Exception handling basics – Multiple catch Clauses – Nested try Statements – Java's Built-in Exceptions – User defined Exception. Multithreaded Programming: Java Thread Model–Creating a Thread and Multiple Threads – Priorities – Synchronization – Inter Thread Communication - Suspending –Resuming, and Stopping Threads – Multithreading. Wrappers – Auto boxing.

UNIT IV I/O, GENERICS, STRING HANDLING 10

I/O Basics – Reading and Writing Console I/O – Reading and Writing Files. Generics: Generic Programming – Generic classes – Generic Methods – Bounded Types – Restrictions and Limitations. Strings: Basic String class, methods and String Buffer Class.

UNIT V JAVAFX EVENT HANDLING, CONTROLS, COMPONENTS 8

JAVAFX Events and Controls: Event Basics – Handling Key and Mouse Events. Controls: Checkbox, ToggleButton – RadioButtons – ListView – ComboBox – ChoiceBox – Text Controls – ScrollPane. Layouts – FlowPane – HBox and VBox – BorderPane – StackPane – GridPane. Menus – Basics – Menu – Menu bars – MenuItem.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

At the end of the course the

CO1: Apply the concepts of classes and objects to solve simple problems

CO2: Develop programs using packages and interfaces

CO3: Construct programs using inheritance concepts.

CO4: Make use of exception handling mechanisms and multithreaded model to solve real world problems

CO5: Build Java applications with I/O packages, string classes, Collections and generics concepts

CO6: Integrate the concepts of event handling and JavaFX components and controls for developing GUI based application

TEXT BOOKS:

1. Herbert Schildt, "Java: The Complete Reference", 11 th Edition, McGraw Hill Education, New Delhi, 2019
2. Herbert Schildt, "Introducing JavaFX 8 Programming", 1 st Edition, McGraw Hill Education, New Delhi, 2015

REFERENCE BOOK:

Cay S. Horstmann, "Core Java Fundamentals", Volume 1, 11 th Edition, Prentice Hall, 2018.

COs	POs												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	2	1	2	1	3	-	-	-	-	-	-	1	3	1	1
2	2	1	2	2	1	-	-	-	-	-	-	2	3	3	1
3	3	3	1	2	2	-	-	-	-	-	-	2	3	1	1
4	3	1	2	2	2	-	-	-	-	-	-	1	3	1	1
5	2	1	2	3	2	-	-	-	-	-	-	1	3	3	1
6	3	2	1	1	2	-	-	-	-	-	-	1	3	1	1
Overall correlation	3	2	1	1	1	-	-	-	-	-	-	1	3	3	1

23CS302 DATABASE MANAGEMENT SYSTEMS

L	T	P	C
3	0	0	3

COURSE OBJECTIVES:

- To learn the fundamentals of data models, conceptualize and depict a database system using ER diagram.
- To study the principles to be followed to create an effective relational database and write SQL queries to store/retrieve data to/from database systems.
- To know the fundamental concepts of transaction processing, concurrency control techniques and recovery procedure.
- To learn about the internal storage structures using different file and indexing techniques and the basics of query processing and optimization.
- To study the basics of distributed databases, semi-structured and un-structured data models.

UNIT I RELATIONAL DATABASES 9

Purpose of Database System – Views of Data – Data Models – Database System Architecture – Introduction to Relational Databases – Relational Model – Keys – Relational Algebra – Relational Calculus – SQL Fundamentals – Advanced SQL features – Triggers – Embedded SQL

UNIT II DATABASE DESIGN 9

Mapping Entity-Relationship Model – ER Diagrams – Functional Dependencies – Non-Loss Decomposition Functional Dependencies – First Normal Form – Second Normal Form – Third Normal Form – Dependency Preservation – Boyce/Codd Normal Form – Multi-Valued Dependencies and Fourth Normal Form – Join Dependencies and Fifth Normal Form.

UNIT III TRANSACTION MANAGEMENT 9

Transaction Concepts – ACID Properties – Serializability – Transaction Isolation Levels – Concurrency Control – Need for Concurrency – Lock-Based Protocols – Deadlock Handling -Recovery System – Failure Classification – Recovery Algorithm.

UNIT IV IMPLEMENTATION TECHNIQUES 9

Overview of Physical Storage Media – RAID – File Organization – Organization of Records in Files – Indexing and Hashing – Ordered Indices – B+ tree Index Files – Static Hashing – Dynamic Hashing – Query Processing Overview – Catalog Information for Cost Estimation – Query Optimization.

UNIT V NOSQL DATABASE 9

Overview of Distributed Databases – Data Fragmentation – Replication – NOSQL Database: Characteristics – CAP theorem – Outline of NOSQL Datastores: Column Oriented, Document, Key-Value and Graph Types – Applications – CRUD Operations.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

At the end of the course the

CO1: Explain the concepts of Database Management Systems and Apply SQL Queries Using relational Algebra

CO2: Apply conceptual modeling to real world applications and design database schemas

CO3: Demonstrate an understanding of normalization theory and apply such knowledge to the normalization of a database.

CO4: Explain the concepts of Transaction Processing and maintain consistency of the database.

CO5: Explain basic database storage structures, access techniques and query processing.

CO6: Describe distributed, semi-structured and unstructured database systems.

TEXT BOOKS:

1. Abraham Silberschatz, Henry F. Korth, S. Sudharshan,"Database System Concepts", Seventh Edition, Tata McGraw Hill, 2019.
2. Ramez Elmasri, Shamkant B. Navathe, "Fundamentals of Database Systems", Seventh Edition, Pearson Education, 2021.

REFERENCE BOOKS:

1. C. J. Date, A. Kannan, S. Swamynathan, "An Introduction to Database Systems", Eighth Edition, Pearson Education, 2006.
2. Raghu Ramakrishnan, Johannes Gehrke, "Database Management Systems", Fourth Edition, Tata McGraw Hill, 2010.
3. G. K. Gupta, "Database Management Systems", Tata McGraw Hill, 2011.
4. Carlos Coronel, Steven Morris, Peter Rob, "Design Implementation and Management", Ninth Edition, Cengage Learning, 2011.

COs	**POs**												**PSOs**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
1	2	2	3	2	1	-	-	-	2	1	1	2	2	1	-
2	3	1	3	1	1	-	-	-	2	1	1	2	3	1	-
3	3	2	3	2	1	-	-	-	2	1	1	2	3	1	-
4	1	2	2	2	-	-	-	-	2	1	1	1	1	-	-
5	1	1	2	2	-	-	-	-	1	1	-	1	1	-	-
6	2	1	3	2	1	-	-	-	-	1	-	2	2	1	-
Overall Correlation	2	2	3	2	1	-	-	-	2	1	1	2	2	1	-

23HS301	UNIVERSAL HUMAN VALUES AND ETHICS	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- Development of a holistic perspective based on self-exploration about themselves (human being), family, society and nature/existence.
- Understanding (or developing clarity) of the harmony in the human being, family, society and nature/existence.
- Strengthening of self-reflection.
- Development of commitment and courage to act.

UNIT I COURSE INTRODUCTION 9

Need, Basic Guidelines, Content and Process for Value Education - Understanding the need, basic guidelines, content and process for Value Education -Self Exploration–what is it? - its content and process; 'Natural Acceptance' and Experiential Validation- as the mechanism for self exploration - Continuous Happiness and Prosperity- A look at basic Human Aspirations -Right understanding, Relationship and Physical Facilities- the basic requirements for fulfilment of aspirations of every human being with their correct priority -Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario -Method to fulfil the above human aspirations: understanding and living in harmony at various levels.

UNIT II UNDERSTANDING HARMONY IN THE HUMAN BEING 9

Harmony in Myself- Understanding human being as a co-existence of the sentient 'I' and the material 'Body' -Understanding the needs of Self ('I') and 'Body' - Sukh and Suvidha- Understanding the Body as an instrument of 'I' (I being the doer, seer and enjoyer) - Understanding the characteristics and activities of 'I' and harmony in 'I' -Understanding the harmony of I with the Body: Sanyam and Swasthya; correct appraisal of Physical needs, meaning of Prosperity.

UNIT III UNDERSTANDING HARMONY IN THE FAMILY AND SOCIETY 9

Harmony in Human-Human Relationship -Understanding Harmony in the family – the basic unit of human interaction -Understanding values in human-human relationship; meaning of Nyaya and program for its fulfilment to ensure satisfaction; Trust(Vishwas) and Respect as the foundational values of relationship -Understanding the meaning of Vishwas; Difference between intention and competence -Understanding the meaning of Samman, Difference between respect and differentiation; the other salient values in relationship -Understanding the harmony in the society (society being an extension of family)-Visualizing a universal harmonious order in society- Undivided Society (Akhand Samaj), Universal Order- from family to world family.

UNIT IV ENGINEERING ETHICS 9

Senses of ‗Engineering Ethics‖ – Variety of moral issues – Types of inquiry – Moral dilemmas – Moral Autonomy – Kohlberg's theory – Gilligan's theory – Consensus and Controversy – Models of professional roles - Theories about right action – Self-interest – Customs and Religion – Uses of Ethical Theories.

UNIT V SAFETY, RESPONSIBILITY AND RIGHTS 9

Safety and Risk – Assessment of Safety and Risk – Risk Benefit Analysis and Reducing Risk - Respect for Authority – Collective Bargaining – Confidentiality – Conflicts of Interest – Occupational Crime – Professional Rights – Employee Rights – Intellectual Property Rights (IPR) – Discrimination-Moral Leadership –Code of Conduct – Corporate Social Responsibility.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

At the end of the course the students will be able to

CO1: Understand the need of value education.

CO2: Comprehend the difference between self and body.

CO3: Understand the need to exist as an unit of Family and society.

CO4: Understand Harmony at all levels.

CO5: Apply the values acquired in the professional front.

CO6: Identify appropriate technologies for ecofriendly production systems.

TEXT BOOKS:

1. Human Values and Professional Ethics by R R Gaur, R Sangal, G P Bagaria, Excel Books, New Delhi, 2010.
2. Mike W. Martin and Roland Schinzinger, ―Ethics in Engineering‖, Tata McGraw Hill, New Delhi, 2003.
3. Govindarajan M, Natarajan S, Senthil Kumar V. S, ―Engineering Ethics‖, Prentice Hall of India, New Delhi, 2004

REFERENCE BOOKS:

1. Jeevan Vidya: Ek Parichaya, A Nagaraj, Jeevan Vidya Prakashan, Amarkantak, 1999.
2. Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004.
3. The Story of Stuff (Book).
4. The Story of My Experiments with Truth - by Mohandas Karamchand Gandhi AICTE Model Curriculum in Humanities, Social Science and Management Courses (UG Engineering & Technology) 169 | Page .
5. Small is Beautiful - E. F Schumacher.
6. Slow is Beautiful - Cecile Andrews.
7. Economy of Permanence - J C Kumarappa 8. Bharat Mein Angreji Raj – Pandit Sunderlal.

8. Rediscovering India - by Dharampal.
9. Hind Swaraj or Indian Home Rule - by Mohandas K. Gandhi .
10. India Wins Freedom - Maulana Abdul Kalam Azad.
11. Vivekananda - Romain Rolland (English) 13. Gandhi - Romain Rolland (English).
12. Charles B. Fleddermann, ―Engineering Ethics‖, Pearson Prentice Hall, New Jersey, 2004.
13. Charles E. Harris, Michael S. Pritchard and Michael J. Rabins, ―Engineering Ethics – Concepts and Cases‖, Cengage Learning, 2009.

WEB SOURCES:

1. www.onlineethics.org
2. www.nspe.org
3. www.globalethics.org

COs	POs												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	-	-	-	-	-	3	3	3	3	3	-	-	-	-	3
2	-	-	-	-	-	3	3	3	3	3	-	-	-	-	3
3	-	-	-	-	-	3	3	3	3	3	-	-	-	-	3
4	-	-	-	-	-	3	3	3	3	3	-	-	-	-	3
5	-	-	-	-	-	3	3	3	3	3	-	-	-	-	3
6	-	-	-	-	-	3	3	3	3	3	-	-	-	-	3
Overall correlation	-	-	-	-	-	3	3	3	3	3	-	-	-	-	3

23CS311 DIGITAL PRINCIPLES AND SYSTEM DESIGN

L	T	P	C
3	0	2	4

COURSE OBJECTIVES:

- To design digital circuits using simplified Boolean functions
- To analyze and design combinational circuits
- To analyze and design synchronous and asynchronous sequential circuits
- To understand Programmable Logic Devices
- To write HDL code for combinational and sequential circuits

UNIT I BOOLEAN ALGEBRA AND LOGIC GATES 9

Number Systems - Arithmetic Operations - Binary Codes- Boolean Algebra and Logic Gates - Theorems and Properties of Boolean Algebra - Boolean Functions - Canonical and Standard Forms - Simplification of Boolean Functions using Karnaugh Map - Logic Gates – NAND and NOR Implementations.

UNIT II COMBINATIONAL LOGIC 9

Combinational Circuits – Analysis and Design Procedures - Binary Adder-Subtractor - Decimal Adder - Binary Multiplier - Magnitude Comparator - Decoders – Encoders – Multiplexers - Introduction to HDL – HDL Models of Combinational circuits.

UNIT III SYNCHRONOUS SEQUENTIAL LOGIC 9

Sequential Circuits - Storage Elements: Latches , Flip-Flops - Analysis of Clocked Sequential Circuits - State Reduction and Assignment - Design Procedure - Registers and Counters - HDL Models of Sequential Circuits.

UNIT IV ASYNCHRONOUS SEQUENTIAL LOGIC 9

Analysis and Design of Asynchronous Sequential Circuits – Reduction of State and Flow Tables – Race-free State Assignment – Hazards.

UNIT V MEMORY AND PROGRAMMABLE LOGIC 9

RAM – Memory Decoding – Error Detection and Correction - ROM - Programmable Logic Array – Programmable Array Logic – Sequential Programmable Devices.

TOTAL: 45 PERIODS

PRACTICAL EXERCISES: 30 PERIODS

1. Design of adders and subtractors.
2. Design of code converters.
3. Design of Multiplexers & Demultiplexers.
4. Design of Encoders and Decoders.
5. Design of Magnitude Comparators
6. Design and implementation of counters using flip-flops
7. Design and implementation of shift registers.

COURSE OUTCOMES:

At the end of the course the students will be able to

CO1: Simplify Boolean functions using K-Map

CO2: Design and Analyze Combinational Circuits

CO3: Design and Analyze Sequential Circuits

CO4: Design HDL models for combinational and Sequential Circuits

CO5: Illustrate various Asynchronous sequential circuits.

CO6: Implement designs using Programmable Logic Devices

TOTAL: 45 + 30 = 75 PERIODS

TEXT BOOKS:

1. M. Morris R. Mano, Michael D. Ciletti, "Digital Design: With an Introduction to the Verilog HDL, VHDL, and System Verilog", 6th Edition, Pearson Education, 2017.
2. G. K. Kharate, "Digital Electronics", Oxford University Press, 2010

REFERENCE BOOKS:

1. John F. Wakerly, "Digital Design Principles and Practices", Fifth Edition, Pearson Education, 2017.
2. Charles H. Roth Jr, Larry L. Kinney, "Fundamentals of Logic Design", Sixth Edition, CENGAGE Learning, 2013.
3. Donald D. Givone, "Digital Principles and Design", Tata Mc Graw Hill, 2003.

COs	POs												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	2	1	-	-	1	-	-	-	-	1	-	-	2	1	-
2	3	2	1	1	1	-	-	-	-	1	-	-	3	1	-
3	3	2	1	1	2	-	-	-	2	1	-	-	3	1	-
4	3	2	1	1	2	-	-	-	2	1	-	-	3	1	-
5	2	1	-	-	1	-	-	-	2	1	-	-	2	1	-
6	2	1	-	-	1	-	-	-	-	1	-	-	2	1	-
Overall correlation	**3**	**2**	**1**	**1**	**2**	-	-	-	**2**	**2**	-	-	**3**	**2**	-

23CS312 DESIGN AND ANALYSIS OF ALGORITHMS

L	T	P	C
3	0	2	4

COURSE OBJECTIVES:

- To understand and apply the algorithm analysis techniques on searching and sorting algorithms
- To critically analyze the efficiency of graph algorithms
- To understand different algorithm design techniques
- To solve programming problems using state space tree
- To understand the concepts behind NP Completeness, Approximation algorithms and randomized algorithms

UNIT I INTRODUCTION 9

Time and space complexity - Asymptotic Notations – Solving Recurrences: substitution method - Lower bounds - hash function - searching: linear search, binary search and Interpolation Search, String Matching: The naïve string - matching algorithm - Rabin-Karp algorithm - Sorting: Insertion sort, heap sort

UNIT II GRAPH ALGORITHMS 9

Representations of graphs - Graph traversal: DFS - BFS - Minimum spanning tree: Kruskal's and Prim's algorithm - Shortest path: Bellman - Ford algorithm - Dijkstra's algorithm - Maximum flow: Flow networks - Ford-Fulkerson method - Maximum bipartite matching.

UNIT III ADVANCED DESIGN AND ANALYSIS TECHNIQUES 9

Divide and Conquer methodology: Merge sort - Quick sort- Dynamic programming: Elements of dynamic programming - Matrix-chain multiplication - Multi stage graphs. Greedy Technique: Elements of the greedy strategy - Activity-selection problem - Huffman Trees

UNIT IV STATE SPACE SEARCH ALGORITHMS 9

Backtracking : n-Queens problem - Hamiltonian Circuit Problem - Subset Sum Problem - Graph colouring problem Branch and Bound : Solving 15-Puzzle problem - Assignment problem - Knapsack Problem - Travelling Salesman Problem.

UNIT V NP-COMPLETE AND APPROXIMATION ALGORITHM 9

Tractable and intractable problems: Polynomial time algorithms - Venn diagram representation – Non Deterministic algorithms - NP-hardness and NP-completeness - Problem reduction: TSP - 3 CNF problem. Approximation Algorithms: Bin Packing problem - Randomized Algorithms: concept and application - primality testing - randomized quick sort.

TOTAL: 45 PERIODS

PRACTICAL EXERCISES: 30 PERIODS

1. Sort a given set of elements using the Quick sort method and determine the time required to sort the elements. Repeat the experiment for different values of n, the number of elements in the list to be sorted. The elements can be read from a file or can be generated using the random number generator.
2. Implement a Merge Sort algorithm to sort a given set of elements and determine the time required to sort the elements. Repeat the experiment for different values of n, the number of elements in the list to be sorted. The elements can be read from a file or can be generated using the random number generator.
3. (A) Obtain the Topological ordering of vertices in a given digraph. (B) Compute the transitive closure of a given directed graph using Warshall's algorithm.
4. Implement 0/1 Knapsack problem using Dynamic Programming.
5. From a given vertex in a weighted connected graph, find shortest paths to other vertices using Dijikstra's algorithm
6. Find Minimum Cost Spanning Tree of a given undirected graph using Kruskal's algorithm.
7. (A) Print all the nodes reachable from a given starting node in a digraph using BFS method. (B) Check whether a given graph is connected or not using DFS method.
8. Find a subset of a given set S = {s1, s2,….., sN} of n positive integers whose sum is equal to a given positive integer d. For example, if S= {1, 2, 5, 6, 8} and d = 9 there are two solutions {1,2,6}and{1,8}.A suitable message is to be displayed if the given problem instance doesn't have a solution.
9. Implement any scheme to find the optimal solution for the Traveling Salesperson problem and then solve the same problem instance using any approximation algorithm and determine the error in the approximation.
10. Find Minimum Cost Spanning Tree of a given undirected graph using Prim's algorithm.
11. Implement All-Pairs Shortest Paths Problem using Floyd's algorithm.
12. Implement N Queen's problem using Back Tracking

COURSE OUTCOMES:

At the end of the course the students will be able to

CO1: Apply first law of thermodynamics to solve problems related to open and closedsystems

CO2: Apply the second law of thermodynamics to Engineering devices.

CO3: Estimate the efficiency and performance of various air standard cycles

CO4: Determine efficiency and performance of vapor power cycle.

CO5: Calculate thermodynamics problems related to conduction, convention andradiation

CO6: Determine the jet engine performance by applying thermodynamics properties.

TEXT BOOKS:

1. Nag. P. K., "Engineering Thermodynamics", 6th Edition, Tata McGraw-Hill,New Delhi, 2017.
2. Cengel, Y, M. Boles and M. Kanoğlu, Thermodynamics - An Engineering Approach, Tata McGraw Hill,8thEdition, 2015.
3. Holman.J.P., "Thermodynamics", 3rd Edition, McGraw-Hill, 2007

REFERENCE BOOKS:

1. Anany Levitin, "Introduction to the Design and Analysis of Algorithms", 3rd Edition, Pearson Education, 2012.
2. Alfred V. Aho, John E. Hopcroft and Jeffrey D. Ullman, "Data Structures and Algorithms", Reprint Edition, Pearson Education, 2006.
3. S. Sridhar, "Design and Analysis of Algorithms", Oxford university press, 2014.

COs	**POs**												**PSOs**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
1	3	2	1	1	1	-	-	1	1	1	1	2	2	1	-
2	3	2	1	1	1	-	-	1	1	1	1	2	3	1	-
3	3	2	1	1	1	-	-	1	1	1	1	2	3	1	-
4	3	2	1	1	-	-	-	1	1	1	1	1	1	-	-
5	3	2	1	1	-	-	-	1	1	1	-	1	1	-	-
6	3	2	1	1	1	-	-	1	1	1	-	2	2	1	-
Overall correlation	3	2	1	1	1	-	-	1	1	1	1	2	2	1	-

23CS321	**OBJECT ORIENTED PROGRAMMING LABORATORY**	**L**	**T**	**P**	**C**
		0	**0**	**4**	**2**

COURSE OBJECTIVES:

- To build software development skills using java programming for real-world applications.
- To understand and apply the concepts of classes, packages, interfaces, inheritance, exception handling and file processing.
- To develop applications using generic programming and event handling

LIST OF EXPERIMENTS

1. Solve problems by using sequential search, binary search, and quadratic sorting algorithms (selection, insertion)
2. Develop stack and queue data structures using classes and objects.
3. Develop a java application with an Employee class with Emp_name, Emp_id, Address, Mail_id, Mobile_no as members. Inherit the classes, Programmer, Assistant Professor, Associate Professor and Professor from employee class. Add Basic Pay (BP) as the member of all the inherited classes with 97% of BP as DA, 10 % of BP as HRA, 12% of BP as PF, 0.1% of BP for staff club funds. Generate pay slips for the employees with their gross and net salary.
4. Write a Java Program to create an abstract class named Shape that contains two integers and an empty method named printArea(). Provide three classes named Rectangle, Triangle and Circle such that each one of the classes extends the class Shape. Each one of the classes contains only the method printArea( ) that prints the area of the given shape.
5. Solve the above problem using an interface.
6. Implement exception handling and creation of user defined exceptions.
7. Write a java program that implements a multi-threaded application that has three threads. First thread generates a random integer every 1 second and if the value is even, the second thread computes the square of the number and prints. If the value is odd, the third thread will print the value of the cube of the number.
8. Write a program to perform file operations.
9. Develop applications to demonstrate the features of generics classes.
10. Develop applications using JavaFX controls, layouts and menus.
11. Develop a mini project for any application using Java concepts.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

At the end of the course the students will be able to

CO1 : Design and develop java programs using object oriented programming concepts

CO2: Construct the java program in inheritance concepts.

CO3: Develop simple applications using object oriented concepts such as package, exceptions

CO4 : Implement multithreading, and generics concepts

CO5: Create GUIs and event driven programming applications for real world problems

CO6: Implement and deploy web applications using Java

COs	POs												PSOs		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
1	3	2	1	1	2	-	-	1	1	1	-	1	2	2	-
2	3	2	1	1	1	-	-	1	1	1	-	1	3	2	-
3	2	1	1	1	2	-	-	1	1	1	-	1	2	1	-
4	2	1	1	1	1	-	-	1	1	1	-	1	2	1	-
5	3	1	1	1	1	-	-	1	1	1	-	1	2	1	-
6	3	1	1	1	1	-	-	1	1	1	-	1	2	1	-
Overall correlation	3	2	1	1	2	-	-	1	1	1	-	1	3	2	-

23CS322	DATABASE MANAGEMENT SYSTEMS LABORATORY	L	T	P	C
		0	0	4	2

COURSE OBJECTIVES:

- To learn and implement important commands in SQL.
- To learn the usage of nested and join queries.
- To understand functions, procedures and procedural extensions of databases.
- To understand design and implementation of typical database applications.
- To understand design of NoSQL
- To be familiar with the use of a front end tool for GUI based application development and its integration with databases

LIST OF EXPERIMENTS

1. Create a database table, add constraints (primary key, unique, check, Not null), insert rows, update and delete rows using SQL DDL and DML commands.
2. Create a set of tables, add foreign key constraints and incorporate referential integrity.
3. Query the database tables using different 'where' clause conditions and also implement aggregate functions.
4. Query the database tables and explore sub queries and simple join operations.
5. Write user defined functions and stored procedures in SQL.
6. Create View and index for database tables with a large number of records.
7. Write row level and statement level SQL Triggers.
8. Create Document, column and graph based data using NOSQL database tools.
9. Add Implement CRUD operation using NOSQL Database.
10. Develop a simple GUI based database application and incorporate all the above mentioned features

TOTAL: 45 PERIODS

COURSE OUTCOMES:

At the end of the course the students will be able to

CO1: Create databases with different types of key constraints.
CO2: Create join queries and explore sub queries.
CO3: Implement queries using aggregate functions.
CO4: Use advanced features such as stored procedures and triggers and incorporate in GUI based application development.
CO5: Create and manipulate data using NOSQL database.
CO6: Develop applications that require a Front-end Tool linked with database

COs	**POs**												**PSOs**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
1	2	2	1	1	2	-	-	1	1	1	-	1	2	2	1
2	2	2	1	1	2	-	-	1	1	1	-	1	2	2	1
3	2	2	1	1	2	-	-	1	1	1	-	1	2	2	1
4	2	2	1	1	2	-	-	1	1	1	-	1	2	2	1
5	2	2	1	1	2	-	-	1	1	1	-	1	2	2	1
6	2	2	1	1	2	-	-	1	1	1	-	1	2	2	1
Overall Correlation	2	2	1	1	2	-	-	1	1	1	-	1	2	2	1

23ES391 PRESENTATION SKILLS

	L	T	P	C
	0	**0**	**2**	**1***

COURSE OBJECTIVES:

- To help learners use brainstorming techniques for generating, organizing and outlining ideas.
- To familiarize learners with different speech structures by engaging them in watching speeches with great opening and closing
- To give practice on voice modulation and use of body language and eye contact for making captivating presentations
- To give hands on training on preparing presentation slides and using remote presentation tools
- To train students on responding to question and feedback with confidence.

UNIT I BRAINSTORMING AND OUTLINING 6

Mind Mapping based on prior knowledge, collecting additional information from external resources, giving prompts to Generative AI tools seeking information, organizing ideas generated, knowing your audience

UNIT II STRUCTURING THE PRESENTATION 6

3 Ts of a presentation, writing effective introduction- Beginning the introduction with a hook (question, data, storytelling) and closing the introduction with the objective of the presentation. Structuring the body paragraphs -Choosing key ideas from the list of ideas generated during brainstorming. Substantiating ideas with examples, data, reasons and anecdotes. Summarizing the ideas for conclusion.

UNIT III DELIVERY TECHNIQUES 6

Vocal variety, intonation, reducing filler words and improving articulation, inflection, engaging the audience. Body language- eye contact, gestures, movement on stage.

UNIT IV USE OF TECHNOLOGICAL AIDS 6

Use of presentation software like MS Power Point, Google Slides etc, incorporating images, graphs, charts and videos, using interactive tools like quizzes and polls, using remote presentation tools like zoom, MS Teams, WebEx for screen sharing, virtual whiteboards and chat functionalities, incorporating AR/VR for more immersive presentations .

UNIT V HANDLING QUESTIONS AND FEEDBACK 6

Audience engagement through questions, PAR (Point, Answer, Redirect) strategy for structuring responses to questions. Understanding feedback process - Receiving, interpreting and evaluating constructively, active listening techniques for processing feedback, responding to feedback- acknowledging, clarifying and appreciating, Dealing with challenging feedback.

TOTAL: 30 PERIODS

COURSE OUTCOMES:

After completion of the course, the students should be able to

CO1 construct ideas for presentation through mind mapping techniques

CO2 organize ideas and structure the presentation with captivating introduction, body paragraphs illustrated with examples and reasons and compelling conclusion

CO3 apply vocal variety and body language techniques to enhance delivery

CO4 prepare engaging presentations by integrating multimedia elements

CO5 demonstrate proficiency in delivering presentations in remote platforms utilizing various technological tools and strategies to engage audience in virtual environments

CO6 exhibit active listening skills by responding to questions with clarity and confidence and incorporating constructive feedback for professional development

TEXT BOOKS:

1. "Slide:ology: The Art and Science of Creating Great Presentations" by Nancy Duarte. O'Reilly Media
2. "The Naked Presenter: Delivering Powerful Presentations With or Without Slides" by Garr Reynolds. New Riders

REFERENCE BOOK:

Talk Like TED: The 9 Public-Speaking Secrets of the World's Top Minds" by Carmine Gallo.

23MA301 LINEAR ALGEBRA

L	T	P	C
3	1	0	4

COURSE OBJECTIVES:

- To test the consistency and solve system of linear equations
- To find the basis and dimension of vector space
- To obtain the matrix of linear transformation and its eigenvalues and eigenvectors
- To find orthonormal basis of inner product space and find least square approximation
- To find eigenvalues of a matrix using numerical techniques and perform matrix decomposition.

UNIT I MATRICES AND SYSTEM OF LINEAR EQUATIONS 9+3

Matrices - Row echelon form - Rank - System of linear equations - Consistency - Gauss elimination method - Gauss Jordon method – Gauss Seidel Method

UNIT II VECTOR SPACES 9+3

Vector spaces - Subspace - Linear independence and dependence – Linear Span - Basis and dimension – Maximal Linearly Independent Subsets.

UNIT III LINEAR TRANSFORMATION 9+3

Linear transformation - Rank space and null space - Rank and nullity - Dimension theorem - Matrix representation of linear transformation - Eigenvalues and eigenvectors of linear transformation – Invertibility and Isomorphisms – Dual Spaces – Homogeneous Linear Differential Equations with Constant coefficients .

UNIT IV INNER PRODUCT SPACES 9+3

Inner product and norms - Properties - Orthogonal, Orthonormal vectors - Gram Schmidt orthonormalization process – Adjoint of Linear operator – Normal and self adjoint operators – Unitary and orthogonal operators and their Matrices

UNIT V EIGENVALUE PROBLEMS AND MATRIX DECOMPOSITION 9+3

Eigen value Problems - Power method, Jacobi rotation method - Singular value decomposition - QR decomposition – Generalized Inverse - Least square solution

TOTAL: 60 PERIODS

COURSE OUTCOMES:

At the end of the course the students will be able to

CO 1 Test the consistency and solve system of linear equations.

CO 2 Find the basis and dimension of vector space.

CO 3 Obtain the matrix of linear transformation and its eigenvalues and eigenvectors.

CO 4 Find orthonormal basis of inner product space and least square approximation.

CO 5 Find eigenvalues of a matrix using numerical techniques

CO 6 Perform Matrix Decomposition using different techniques

TEXT BOOKS:

1. Friedberg A.H, Insel A.J. and Spence L, "Linear Algebra", Prentice Hall of India, New Delhi, 2004.
2. Faires J.D. and Burden R., "Numerical Methods", Brooks/Cole (Thomson Publications), New Delhi, 2002.

REFERENCE BOOKS:

1. Kumaresan S, "Linear Algebra - A geometric approach", Prentice Hall of India, New Delhi, Reprint, 2010.
2. P.S.Das – "Numerical Analysis", Pearson Educations, New Delhi, 2002
3. Richard Branson, "Matrix Operations", Schaum's outline series, 1989.

COs	POs												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	3	2	2	-	-	-	-	-	-	-	-	-	-	-	2
2	3	2	2	-	-	-	-	-	-	-	-	-	-	-	2
3	3	2	2	-	-	-	-	-	-	-	-	-	-	-	2
4	3	2	2	-	-	-	-	-	-	-	-	-	-	-	2
5	3	2	2	-	-	-	-	-	-	-	-	-	-	-	2
6	3	2	2	-	-	-	-	-	-	-	-	-	-	-	2
Overall Correlation	3	2	2	-	-	-	-	-	-	-	-	-	-	-	2

23CS401 OPERATING SYSTEMS

L	T	P	C
3	0	0	3

COURSE OBJECTIVES:

- To understand the basics and functions of operating systems.
- To understand processes and threads
- To analyze scheduling algorithms and process synchronization.
- To understand the concept of deadlocks.
- To analyze various memory management schemes.
- To be familiar with I/O management and file systems.
- To be familiar with the basics of virtual machines and Mobile OS like iOS and Android**.**

UNIT I INTRODUCTION 10

Introduction to Operating Systems – Views of Operating system, Computer System organization, Computer System Architecture; **Operating System Structures** – Operating System Services - User Operating System Interface - System Calls – System Programs - Design and Implementation - Structuring methods; **Processes** - Process Concept, Process Scheduling, Operations on Processes, Inter-process Communication – Shared Memory Systems, Message Passing Systems, **Threads** - Multithread Models.

UNIT II PROCESS MANAGEMENT 9

CPU Scheduling – Basic Concepts, Scheduling criteria - Scheduling algorithms; **Process Synchronization** - The Critical-Section problem, Synchronization hardware, Mutex Locks, Semaphores, Monitors, Classical problems of synchronization; **Deadlock** – Deadlock Characterization, Methods for handling deadlocks, Deadlock prevention, Deadlock avoidance, Deadlock detection, Recovery from deadlock.

UNIT III MEMORY MANAGEMENT 9

Main Memory – Address Binding, Logical and Physical Address Space, Contiguous Memory Allocation, Segmentation, Paging, Structure of the Page Table; **Virtual Memory** - Demand Paging, Copy on Write, Page Replacement, Thrashing.

UNIT IV STORAGE MANAGEMENT 8

Mass Storage system –Disk Scheduling and Management; **I/O Systems** – I/O Hardware, Kernel I/O subsystem; File-System Interface - File concept, Access methods, Directory Structure, File system mounting - File Sharing and Protection; **File System Implementation** - File System Structure - Directory implementation - Allocation Methods - Free Space Management;

UNIT V VIRTUAL MACHINES AND MOBILE OS 9

Virtual Machines – Benefits and Features, Building Blocks, Types of Virtual Machines and their Implementations, Virtualization and Operating-System Components; Mobile OS - iOS and Android

TOTAL: 45 PERIODS

COURSE OUTCOMES:

At the end of the course the students will be able to

CO1 Explain operating system structures and various services provided by operating systems

CO2 Apply Process synchronization, process scheduling, and deadlocks concepts in the given scenario to solve the problems.

CO3 Apply algorithms and suitable techniques for memory management.

CO4 Apply disk scheduling algorithm and explain the management schemes for storage systems such as file and I/O systems.

CO5 Explain the concept of Virtual machines

CO6 Explain the functionalities of iOS and Android Operating Systems.

TEXT BOOK:

Abraham Silberschatz, Peter Baer Galvin and Greg Gagne, “Operating System Concepts”, 10th Edition, John Wiley and Sons Inc., 2018.

REFERENCE BOOKS:

1. Ramaz Elmasri, A. Gil Carrick, David Levine, “Operating Systems – A Spiral Approach”, Tata McGraw Hill Edition, 2010.
2. William Stallings, "Operating Systems: Internals and Design Principles", 7th Edition, Prentice Hall, 2018.
3. Achyut S.Godbole, Atul Kahate, “Operating Systems”, McGraw Hill Education, 2016.

COs	**POs**												**PSOs**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
1	2	1	1	1	1	-	-	1	1	1	1	2	2	1	-
2	3	2	1	1	1	-	-	1	1	1	1	2	3	1	-
3	3	2	1	1	1	-	-	1	1	1	1	2	3	1	-
4	2	1	1	1	1	-	-	1	1	1	1	1	1	-	-
5	3	2	1	1	1	-	-	1	1	1	-	1	1	-	-
6	2	1	1	1	1	-	-	1	1	1	-	2	2	1	-
Overall Correlation	3	3	2	1	1	-	-	1	1	1	1	2	2	1	-

23CS402 ARTIFICIAL INTELLIGENCE

L	T	P	C
3	0	0	3

COURSE OBJECTIVES:

- To understand the various characteristics of intelligent agents
- To learn the different search strategies in AI
- To learn to represent knowledge in solving AI problems
- To understand the different ways of designing software agents
- To know about the various applications of AI.

UNIT I INTRODUCTION **9**

Introduction–Definition - Future of Artificial Intelligence – Characteristics of Intelligent Agents– Typical Intelligent Agents – Problem Solving Approach to Typical AI problems.

UNIT II PROBLEM SOLVING METHODS **9**

Problem solving Methods - Search Strategies- Uninformed - Informed - Heuristics - Local Search Algorithms and Optimization Problems - Searching with Partial Observations - Constraint Satisfaction Problems – Constraint Propagation - Backtracking Search - Game Playing - Optimal Decisions in Games – Alpha - Beta Pruning - Stochastic Games

UNIT III KNOWLEDGE REPRESENTATION **9**

First Order Predicate Logic – Prolog Programming – Unification – Forward Chaining Backward Chaining – Resolution – Knowledge Representation - Ontological Engineering-Categories and Objects – Events - Mental Events and Mental Objects - Reasoning Systems for Categories - Reasoning with Default Information.

UNIT IV SOFTWARE AGENTS **9**

Architecture for Intelligent Agents – Types and Characteristics of Agents-Agent communication – Negotiation and Bargaining – Argumentation among Agents – Trust and Reputation in Multi-agent systems.

UNIT V APPLICATIONS **9**

AI applications – Language Models – Information Retrieval- Information Extraction – Natural Language Processing - Machine Translation – Speech Recognition – Robot – Hardware – Perception – Planning – Moving.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

At the end of the course the students will be able to

CO1: Use appropriate search algorithms for any AI problem.

CO2: Represent a problem using first order and predicate logic.

CO3: Provide the apt agent strategy to solve a given problem.

CO4: Develop a language/frameworks of different AI methods using Knowledge representation.

CO5: Design software agents to solve a problem.

CO6: Design applications for NLP that use Artificial Intelligence.

TEXT BOOKS:

1. S. Russell and P. Norvig, "Artificial Intelligence: A Modern Approach", Prentice Hall, Third Edition, 2009.
2. Bratko, "Prolog: Programming for Artificial Intelligence", Fourth edition, Addison Wesley Educational Publishers Inc., 2011.

REFERENCE BOOKS:

1. M. Tim Jones, "Artificial Intelligence: A Systems Approach (Computer Science)", Jones and Bartlett Publishers, Inc.; First Edition, 2008.
2. Nils J. Nilsson, "The Quest for Artificial Intelligence", Cambridge University Press, 2009
3. William F. Clocksin and Christopher S. Mellish, "Programming in Prolog: Using the ISO Standard", Fifth Edition, Springer, 2003
4. Gerhard Weiss, "Multi Agent Systems", Second Edition, MIT Press, 2013
5. David L. Poole and Alan K. Mackworth, "Artificial Intelligence: Foundations of Computational Agents", Cambridge University Press, 2010

COs	POs												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	3	1	1	3	1	1	1	1	3	3	2	1	3	3	1
2	2	3	1	3	2	1	1	1	1	2	2	2	1	2	1
3	1	3	3	2	2	1	1	1	2	3	1	2	1	3	1
4	1	2	3	3	1	1	1	1	3	2	1	3	3	3	1
5	1	2	3	2	1	2	2	2	2	1	1	1	3	2	1
Overall correlation	1	2	3	2	1	1	1	1	2	1	1	1	3	2	1

23CS403	THEORY OF COMPUTATION	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To understand the language hierarchy
- To construct automata for any given pattern and find its equivalent regular expressions
- To design a context free grammar for any given language
- To understand Turing machines and their capability
- To understand undecidable problems and NP class problems

UNIT I AUTOMATA FUNDAMENTALS **9**

Introduction to formal proof – Additional forms of Proof – Inductive Proofs –Finite Automata – Deterministic Finite Automata – Non-deterministic Finite Automata – Finite Automata with Epsilon Transitions

UNIT II REGULAR XPRESSIONS AND LANGUAGES **9**

Regular Expressions – FA and Regular Expressions – Proving Languages not to be regular – Closure Properties of Regular Languages – Equivalence and Minimization of Automata.

UNIT III CONTEXT FREE GRAMMAR AND LANGUAGES **9**

CFG – Parse Trees – Ambiguity in Grammars and Languages – Definition of the Pushdown Automata – Languages of a Pushdown Automata – Equivalence of Pushdown Automata and CFG, Deterministic Pushdown Automata.

UNIT IV PROPERTIES OF CONTEXT FREE LANGUAGES **9**

Normal Forms for CFG – Pumping Lemma for CFL – Closure Properties of CFL – Turing Machines– Programming Techniques for TM.

UNIT V UNDECIDABILITY **9**

Non-Recursive Enumerable (RE) Language – Undecidable Problem with RE – Undecidable Problems about TM – Post's Correspondence Problem, The Class P and NP.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

At the end of the course the students will be able to

CO1: Derive mathematical proofs such as deductive proof, proof by contradiction and proof by induction.

CO2: Construct a finite state automaton for a given regular language.

CO3: Develop a normalized context free grammar for a given context free language.

CO4: Construct a pushdown automaton for a given context-free language

CO5: Construct a Turing machine for deciding a given problem.

CO6: Explain the decidability or undecidability of various problems.

TEXT BOOKS:

1. J.E.Hopcroft, R.Motwani and J.D Ullman, " Introduction to Automata Theory", Languages and Computations, Third Edition, Pearson Education, 2008.
2. John C Martin, "Introduction to languages and the Theory of Computation", 4th Edition, Tata McGraw Hill, 2011.

REFERENCE BOOKS:

1. H.R.Lewis and C.H.Papadimitriou, "Elements of the theory of Computation", Second Edition,PHI, 2015.
2. Peter Linz, "An Introduction to Formal Language and Automata", 6th Edition, Jones & Bartlett, 2016.
3. K.L.P. Mishra and N Chandrasekaran, "Theory of Computer Science: Automata Languages and Computation", 3rd Edition, Prentice Hall of India, 2006.
4. Micheal Sipser, "Introduction of the Theory and Computation", Thomson Brokecole, 1997.

COs	POs												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	3	2	1	1	1	-	-	-	1	1	1	2	2	3	-
2	3	2	1	1	2	-	-	-	2	2	2	2	3	2	-
3	3	2	1	1	2	-	-	-	2	2	1	2	3	2	-
4	3	2	1	1	2	-	-	-	2	2	2	2	3	2	-
5	3	3	2	2	2	-	-	-	2	1	1	2	3	2	-
6	2	1	1	1	2	-	-	-	1	1	1	2	2	2	-
Overall correlation	3	3	2	2	2	-	-	-	2	2	2	2	3	2	-

23CS404 COMPUTER ARCHITECTURE

	L	T	P	C
	3	0	0	3

COURSE OBJECTIVES:

- To learn the basic structure and operations of a computer.
- To learn the arithmetic and logic unit and implementation of fixed-point and floating point arithmetic unit.
- To learn the basics of pipelined execution.
- To understand the memory hierarchies, cache memories and virtual memories.
- To introduce the parallel processing technique.

UNIT I BASIC STRUCTURE OF A COMPUTER SYSTEM 9

Functional Units – Basic Operational Concepts – Performance – Instructions: Language of the Computer – Operations, Operands – Instruction representation – Logical operations decision making – MIPS Addressing.

UNIT II ARITHMETIC FOR COMPUTERS 9

Addition and Subtraction – Multiplication – Division – Floating Point Representation – Floating Point Operations

UNIT III PROCESSOR AND CONTROL UNIT 9

Basic MIPS implementation – Building a Datapath – Control Implementation Scheme – Pipelining – Pipelined datapath and control – Handling Data Hazards & Control Hazards Exceptions

UNIT IV MEMORY AND I/O ORGANIZATION 9

Memory hierarchy, Memory Chip Organization, Cache memory, Virtual memory. Parallel Bus Architectures, Internal Communication Methodologies, Serial Bus Architectures, Mass storage, Input and Output Devices.

UNIT V ADVANCED COMPUTER ARCHITECTURE 9

Parallel processing architectures and challenges, Hardware multithreading, Multicore and shared memory multiprocessors, Introduction to Graphics Processing Units, Clusters and Warehouse scale computers, Introduction to Multiprocessor network topologies.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

At the end of the course the students will be able to

CO1: Construct the basics structure of computers, operations and instructions.

CO2: Design arithmetic and logic unit.

CO3: Explain pipelined execution and control unit.

CO4: Discuss the various memory systems and I/O communication.

CO5: Design parallel processing architectures.

CO6: Construct the hardware interface for real time applications.

TEXT BOOKS:

1. David A. Patterson and John L. Hennessy, Computer Organization and Design: The Hardware/Software Interface, Fifth Edition, Morgan Kaufmann / Elsevier, 2014.
2. Carl Hamacher, Zvonko Vranesic, Safwat Zaky and Naraig Manjikian, Computer Organization and Embedded Systems, Sixth Edition, Tata McGraw Hill, 2012.

REFERENCE BOOKS:

1. William Stallings, Computer Organization and Architecture – Designing for Performance, Eighth Edition, Pearson Education, 2010.
2. John P. Hayes, Computer Architecture and Organization, Third Edition, Tata McGraw Hill, 2012.
3. Govindarajalu, "Computer Architecture and Organization, Design Principles and Applications", Second edition, McGraw-Hill Education India Pvt Ltd, 2014.

COs	**POs**												**PSOs**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
1	3	2	1	1	1	-	-	-	1	1	1	2	3	1	-
2	3	2	1	1	2	-	-	-	2	2	2	2	3	2	-
3	3	2	1	1	2	-	-	-	2	2	1	2	3	2	-
4	3	2	1	1	2	-	-	-	2	2	2	2	3	2	-
5	3	3	2	2	2	-	-	-	2	1	1	2	3	2	-
6	2	1	1	1	2	-	-	-	1	1	1	2	2	2	-
Overall correlation	3	3	2	2	2	-	-	-	2	2	2	2	3	2	-

23CS411 SOFTWARE ENGINEERING

L	T	P	C
3	0	2	4

COURSE OBJECTIVES:

- To make the student understand the software process with different models.
- To familiarize the student with requirements engineering and software design concepts.
- To impart knowledge to the student in various software testing techniques and product metrics.
- To make the student recognize the significance of software quality and project management.
- To acquaint the student with the software maintenance and reengineering process.

UNIT I SOFTWARE PROCESS 9

Introduction to software engineering – Layers in software engineering – Generic process framework – Software general principles and myths – Process models: Waterfall model, Incremental process model, Evolutionary process models, Concurrent models, Specialized process models, Unified process, Personal and Team process models – Process assessment and improvement approaches – Agile process models.

UNIT II REQUIREMENTS AND SOFTWARE DESIGN 9

Introduction to Requirements engineering: Functional and Nonfunctional requirements – Requirement specification template – Eliciting requirements – Requirements analysis – Requirements modeling: Class-based modeling, Flow-oriented model, Behavioral model – Design process – Design concepts – Design model dimensions – Software architecture – Architectural styles – Architectural mapping using data flow – User interface analysis and design.

UNIT III SOFTWARE TESTING AND METRICS 9

Testing strategies for: Conventional software, Object-oriented software, Web-apps – Strategic issues – Software testing fundamentals – Validation testing – System testing – White-box testing – Black-box testing – Debugging – SCM process – Metrics for requirements model – Metrics for design model: Architectural design metrics, Lorenz and Kidd OO Metrics, Component-level design metrics – Metrics for source code – Metrics for testing and maintenance.

UNIT IV SOFTWARE QUALITY AND PROJECT MANAGEMENT 9

Elements of SQA – SQA Tasks, Goals, Metrics – Statistical SQA – Software Reliability – ISO 9000 Quality Standards – SQA Plan – Project management spectrum – People – Product-Process – Project – W^5HH Principle – Critical Practices.

UNIT V MAINTENANCE AND REENGINEERING 9

Software Maintenance – Software Supportability - Reengineering – Business process reengineering – Software Reengineering - Reverse Engineering – Restructuring – Forward Engineering – Economics of Reengineering.

TOTAL: 45 PERIODS

PRACTICAL EXERCISES: 30 PERIODS

1. Identify the problem statement to define a given project within the bounded scope of the project.
2. Select relevant process model to define activities and related tasks set for an assigned project.
3. Gather application specific requirements to assimilate into requirements engineering model.
4. Prepare a broad SRS for a given project.
5. Develop DFD model (level-0, level-1 DFD and data dictionary) for a given project.
6. Write test cases to validate requirements of an assigned project from a SRS document.
7. Evaluate size of the project using function point metric for an assigned project.
8. Prepare SQA plan that facilitates various attributes of quality of a product.
9. Estimate the cost of a given project by using the COCOMO model.
10. Use CPM/PERT for scheduling an assigned project.

COURSE OUTCOMES:

At the end of the course the students will be able to

CO1: Select the appropriate process model to develop a project.

CO2: Evaluate and analyze the software requirements specification document and software design.

CO3: Summarize the significance of various testing strategies and techniques and their role in testing phase.

CO4: Evaluate and analyze different product metrics and understand the importance of SCM.

CO5: Explore the role of SQA in software engineering and the benefits of project management.

CO6: Explain the different concepts and aspects of software maintenance and reengineering methods.

TEXT BOOKS:

1. Roger S. Pressman, "Software Engineering: A Practitioner's Approach", McGraw Hill Education, 7th Edition, New Delhi, 2009.
2. Ian Sommerville, "Software Engineering", Pearson Education, 10th Edition, India, 2017.

REFERENCE BOOKS:

1. James F. Peters, Witold Pedrycz, "Software Engineering, and Engineering Approach", John Wiley, New Delhi, 2000.
2. K. K. Aggarwal, Yogesh Singh, "Software Engineering", New Age International Publishers, 3rd Edition, New Delhi, 2007.
3. Rajib Mall, "Fundamentals of Software Engineering", PHI Learning Private Limited, 4th Edition, New Delhi, 2014.
4. Gary B. Shelly, Harry J. Rosenblatt, "System Analysis and Design", Course Technology, 9th Edition, USA, 2012.

COs	**POs**												**PSOs**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
1	3	2	1	1	1	-	-	-	1	1	1	2	3	1	-
2	3	2	1	1	2	-	-	-	2	2	2	2	3	2	-
3	3	2	1	1	2	-	-	-	2	2	1	2	3	2	-
4	3	2	1	1	2	-	-	-	2	2	2	2	3	2	-
5	3	3	2	2	2	-	-	-	2	1	1	2	3	2	-
6	2	1	1	1	2	-	-	-	1	1	1	2	2	2	-
Overall correlation	3	3	2	2	2	-	-	-	2	2	2	2	3	2	-

23CS421 OPERATING SYSTEMS LABORATORY

L	T	P	C
0	0	4	2

COURSE OBJECTIVES:

- To install windows operating systems.
- To understand the basics of Unix command and shell programming.
- To implement various CPU scheduling algorithms.
- To implement Deadlock Avoidance and Deadlock Detection Algorithms
- To be familiar with File Organization and File Allocation Strategies.
- To be understand the working virtual machine.

LIST OF EXPERIMENTS :

1. Installation of windows operating system
2. Illustrate UNIX commands and Shell Programming
3. Process Management using System Calls: Fork, Exit, Getpid, Wait, Close
4. Write a C program to simulate producer-consumer problem using semaphores
5. Write a C program to simulate the concept of Dining-Philosophers problem.
6. To work with inter process communication using pipe.
7. Write a C program that takes one or more file/directory names as command line input and reports following information A) File Type B) Number Of Links C) Time of last Access D) Read, write and execute permissions
8. To write C program to organize the file using single level directory.
9. To write C program to organize the file using two level directory.
10. Mount a USB drive to a specific directory and verify its contents on a Linux system.
11. Configure auto mount for a network share and verify seamless access on multiple client machines.
12. Install any guest operating system like Linux using VMware.
13. Create and mount an encrypted file system, ensuring data security, on a virtual machine

TOTAL : 45 PERIODS

COURSE OUTCOMES:

At the end of the course the students will be able to

CO1: Execute basic UNIX commands and shell programming

CO2: Implement process synchronization concepts

CO3: Implement the concept of interprocess communication

CO4: Implement file systems, including local file systems and network file systems (NFS)

CO5: Implement operations on directories.

CO6: Execute data security on virtual machines

COs	POs												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	3	3	3	3	3	2	1	1	2	2	-	1	3	3	-
2	3	3	3	3	3	2	1	1	2	2	-	1	3	3	-
3	3	3	3	3	3	2	1	1	2	2	-	1	3	3	-
4	3	3	3	3	3	2	1	1	2	2	-	1	3	3	-
5	3	3	3	3	3	2	1	1	2	2	-	1	3	3	-
6	3	3	3	3	3	2	1	1	2	2		1	3	3	-
Overall correlation	3	3	3	3	3	3	2	2	3	3	-	1	3	3	-

23CS422 ARTIFICIAL INTELLIGENCE LABORATORY

L	T	P	C
0	0	4	2

COURSE OBJECTIVES:

- To design and implement different techniques to develop simple autonomous agentsthat make effective decisions in fully informed, and partially observable, settings.
- To apply appropriate algorithms for solving given AI problems.To Design and implement logical reasoning agents.
- To Design and implement agents that can reason under uncertainty.
- To understand the Implementation of these reasoning systems using either backwardor forward inference mechanisms

LIST OF EXPERIMENTS :

1. Construct descriptions of agent behavior for various AI tasks
2. Implement basic search strategies for selected AI applications
3. Implement A* and memory bounded A* algorithms
4. Implement genetic algorithms for AI tasks
5. Implement simulated annealing algorithms for AI tasks
6. Implement alpha-beta tree search
7. Implement backtracking algorithms for CSP
8. Implement local search algorithms for CSP
9. Implement propositional logic inferences for AI tasks
10. Implement resolution based first order logic inferences for AI tasks
11. Implement classical planning algorithms

TOTAL : 45 PERIODS

COURSE OUTCOMES:

At the end of the course the students will be able to

CO1: Implement simple PEAS descriptions for given AI tasks.

CO2: Develop programs to implement simulated annealing and genetic algorithms.

CO3: Demonstrate the ability to solve problems using searching and backtracking.

CO4: Ability to implement simple reasoning systems using either backward or forward inference mechanisms.

CO5: Choose and implement a suitable technics for a given AI task choose and implement a suitable technics for a given AI task.

CO6: Design applications for NLP that use Artificial Intelligence.

COs	POs												PSCOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	3	1	1	3	1	1	1	1	3	3	2	1	3	3	1
2	2	3	1	3	2	1	1	1	1	2	2	2	1	2	1
3	1	3	3	2	2	1	1	1	2	3	1	2	1	3	1
4	1	2	3	3	1	1	1	1	3	2	1	3	3	3	1
5	1	2	3	2	1	2	2	2	2	1	1	1	3	2	1
6	1	2	3	2	1	1	1	1	2	1	1	1	3	2	1
Overall correlation	2	2	2	2	1	2	2	2	2	1	1	1	1	2	2

23ES491 APTITUDE AND LOGICAL REASONING –I

L	T	P	C
0	0	2	1

COURSE OBJECTIVES:

- To improve the problem solving and logical thinking ability of the students.
- To acquaint student with frequently asked questions and patterns in quantitative aptitude and logical reasoning.

UNIT I **4**

Numbers, LCM, HCF, Averages, Ratio & Proportion, Mixtures & Allegation.

UNIT II **4**

Percentages, Time and work, Pipes and Cistern, coding and decoding.

UNIT III **4**

Time Speed Distance, Train, Boats and Streams, Analogy.

UNIT IV **4**

Data Interpretation(BAR,PIE,LINE), Seating arrangement.

UNIT V **4**

Simple Interest and Compound Interest, Profit loss and Discount, Partnership.

TOTAL: 20 PERIODS

COURSE OUTCOMES:

At the end of the course the students will be able to

CO 1 Understand the basic concepts of quantitative ability

CO 2 Understand the basic concepts of logical reasoning Skills

CO 3 Increase in critical thinking skills

CO 4 Able to solve campus placements aptitude papers covering Quantitative Ability, Logical Reasoning Ability

TEXT BOOK:

APTIPEDIA, 2nd edition, Wiley Publishers

REFERENCE BOOKS:

1. Quantitative Aptitude – R.S. Agarwal
2. A Modern Approach To Verbal & Non-Verbal Reasoning By R S Agarwal

KCG COLLEGE OF TECHNOLOGY (AUTONOMOUS)
REGULATIONS 2023
B.E. COMPUTER SCIENCE AND ENGINEERING (CYBER SECURITY)
CHOICE BASED CREDIT SYSTEM
CURRICULA FOR SEMESTERS I TO VIII

SEMESTER – I

SL. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
	23IP101	Induction Programme		-	-	-	-	-
THEORY								
1	23HS101	Essential Communication	HSMC	3	0	0	3	3
2	23MA101	Matrices and Calculus	BSC	3	0	0	3	3
3	23CS101	Programming in C	ESC	3	0	0	3	3
4	23HS102	Heritage of Tamils	HSMC	1	0	0	1	1
THEORY AND PRACTICALS								
5	23PH111	Engineering Physics	BSC	3	0	2	5	4
6	23CY111	Engineering Chemistry	BSC	3	0	2	5	4
PRACTICALS								
7	23CS121	C Programming Laboratory	ESC	0	0	4	4	2
8	23HS121	Communication Skills Laboratory	HSMC	0	0	2	2	1
9	23CS122	Computational Thinking	ESC	0	0	2	2	1
10	23HS122	General Clubs / Technical Clubs / NCC / NSS / Extension Activities	HSMC	0	0	2	2	1*
			TOTAL	**16**	**0**	**14**	**30**	**22**

*** The grades earned by the students will be recorded in the Mark Sheet, however the same shall not be considered for the computation of CGPA**

SEMESTER – II

SL. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
THEORY								
1	23HS201/ 23HS202	Professional English / Foreign Language	HSMC	3	0	0	3	3
2	23MA204	Probability and Statistics	BSC	3	1	0	4	4
3	23PH205	Physics for Information Science	BSC	3	0	0	3	3
4	23CS201	Data Structures using C	PCC	3	0	0	3	3
5	23HS203	Tamils & Technology	HSMC	1	0	0	1	1
THEORY AND PRACTICALS								
6	23EE281	Basic Electrical and Electronics Engineering	ESC	2	0	2	4	3
7	23ME211	Engineering Graphics	ESC	3	0	2	5	4
PRACTICALS								
8	23ME221	Engineering Practices Laboratory	ESC	0	0	4	4	2
9	23CS221	Data Structures Using C Laboratory	PCC	0	0	4	4	2
10	23ES291	Soft Skills	EEC	0	0	2	2	1*
			TOTAL	**18**	**1**	**14**	**33**	**25**

SEMESTER III

SL. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK L	T	P	TOTAL CONTACT PERIODS	CREDITS
THEORY								
1	23MA202	Discrete Mathematics	BSC	3	1	0	4	4
2	23CS301	Object Oriented Programming	PCC	3	0	0	3	3
3	23CB301	Database Management Systems and Security	PCC	3	0	0	3	3
4	23HS301	Universal Human Values and Ethics	HSMC	3	0	0	3	3
THEORY AND PRACTICALS								
5	23CB311	Digital Principles and Computer Organization	PCC	3	0	2	5	4
6	23CS312	Design and Analysis of Algorithms	PCC	3	0	2	5	4
PRACTICALS								
7	23CS321	Object Oriented Programming Laboratory	PCC	0	0	4	4	2
8	23CB321	Database Management Systems and Security Laboratory	PCC	0	0	4	4	2
9	23ES391	Presentation Skills	EEC	0	0	2	2	1*
TOTAL				**18**	**0**	**14**	**32**	**25**

SEMESTER IV

SL. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK L	T	P	TOTAL CONTACT PERIODS	CREDITS
THEORY								
1	23MA301	Linear Algebra	BSC	3	1	0	4	4
2	23CB401	Operating Systems and Security	PCC	3	0	0	3	3
3	23CS402	Artificial Intelligence	PCC	3	0	0	3	3
4	23CB402	Information Security Principles	PCC	3	0	0	3	3
5	23CB403	Engineering Secure Software Systems	PCC	3	0	0	3	3
THEORY AND PRACTICALS								
6	23CS611	Internet Programming	PCC	3	0	2	5	4
PRACTICALS								
7	23CB421	Operating Systems and Security Laboratory	PCC	0	0	4	4	2
8	23CS422	Artificial Intelligence Laboratory	PCC	0	0	4	4	2
9	23ES491	Aptitude and Logical Reasoning – 1	EEC	0	0	2	2	1*
10	23CB422	Mini Project – 1	EEC	0	0	2	2	1
TOTAL				**18**	**1**	**14**	**33**	**25**

SEMESTER V

SL. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
THEORY								
1	23RE501	Research Methodology and Intellectual Property Rights	ESC	2	0	0	2	2
2	23CS501	Computer Networks	PCC	3	0	0	3	3
3		Department Elective - 1	DEC	3	0	0	3	3
4		Department Elective - 2	DEC	3	0	0	3	3
5		Non-Department Elective – 1 (Emerging Technology)	NEC	3	0	0	3	3
THEORY AND PRACTICALS								
6	23CB511	Cryptography and Cyber Security	PCC	3	0	2	5	4
PRACTICALS								
7	23CS521	Computer Networks Lab	PCC	0	0	4	4	2
8	23CB521	Mini Project – 2	EEC	0	0	4	4	2
9	23ES591	Aptitude and Logical Reasoning – 2	EEC	0	0	2	2	1*
TOTAL				**17**	**0**	**12**	**29**	**22**

SEMESTER VI

SL. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
THEORY								
1	23CB601	Cyber Forensics	PCC	3	0	0	3	3
2		Department Elective - 3	DEC	3	0	0	3	3
3		Department Elective - 4	DEC	3	0	0	3	3
4		Non-Department Elective 2 (Management / Safety Courses)	NEC	3	0	0	3	3
THEORY AND PRACTICALS								
5	23CE611	Environmental Sciences and Engineering	ESC	3	0	2	5	4
6	23CB611	Penetration and Security Testing	PCC	3	0	2	5	4
PRACTICALS								
7	23CB621	Project Work - Phase 1	EEC	0	0	4	4	2
8	23CB622	Technical Training	EEC	0	0	2	2	1
9	23CB623	Technical Seminar– 1	ESC	0	0	2	2	1
TOTAL				**18**	**0**	**12**	**30**	**24**

SEMESTER VII

SL. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
THEORY								
1		Non-Department Elective - 3 (Management Courses)	NEC	3	0	0	3	3
2		Department Elective - 5	DEC	3	0	0	3	3
3		Department Elective - 6	DEC	3	0	0	3	3
4	23CB701	Comprehension	EEC	2	0	0	2	2
THEORY AND PRACTICALS								
5	23CB711	Blockchain and Security	PCC	3	0	2	5	4
PRACTICALS								
6	23CB721	Project Work - Phase 2	EEC	0	0	6	6	3
7	23CB722	Technical Seminar – 2	ESC	0	0	4	4	2
TOTAL				**14**	**0**	**12**	**26**	**20**

SEMESTER VIII

SL. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
PRACTICALS								
1	23CB821/ 22CB822	Internship / Capstone Project	EEC	0	0	20	20	10
TOTAL				0	0	20	20	10

TOTAL CREDITS: 173

DEPARTMENT ELECTIVE COURSES

VERTICAL 1: CLOUD COMPUTING

SL. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1	23IT031	Distributed and Cloud Computing	DEC	2	0	2	4	3
2	23IT032	Cloud ServicesManagement	DEC	2	0	2	4	3
3	23IT033	Virtualization	DEC	2	0	2	4	3
4	23IT034	Cloud Database Management	DEC	2	0	2	4	3
5	23IT035	Storage Technologies	DEC	2	0	2	4	3
6	23IT036	Security and Privacy in Cloud	DEC	2	0	2	4	3
7	23IT037	Stream Processing	DEC	2	0	2	4	3
8	23IT038	GDP and Cloud Web Services	DEC	2	0	2	4	3

VERTICAL 2: FULL STACK DEVELOPMENT

SL. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1	23CS031	Java Full Stack Development	DEC	2	0	2	4	3
2	23CS032	Mobile App Development	DEC	2	0	2	4	3
3	23CS033	UI and UX Design	DEC	2	0	2	4	3
4	23CS034	MERN Stack Web Development	DEC	2	0	2	4	3
5	23CS035	DevOps	DEC	2	0	2	4	3
6	23CS036	Cognitive Systems	DEC	2	0	2	4	3
7	23CS037	Advanced Java Programming	DEC	2	0	2	4	3
8	23CS038	Python Full Stack Development	DEC	2	0	2	4	3

VERTICAL 3: ARTIFICIAL INTELLIGENCE AND DATA SCIENCE

SL. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1	23IT039	KnowledgeEngineering	DEC	3	0	0	3	3
2	23IT040	Introduction to Data Science	DEC	3	0	0	3	3
3	23IT041	Neural Networks and Deep Learning	DEC	3	0	0	3	3
4	23IT042	Natural Language Processing in AI	DEC	3	0	0	3	3
5	23IT043	Principle practices of AI	DEC	3	0	0	3	3
6	23IT044	Big Data Analytics	DEC	3	0	0	3	3
7	23IT045	Data Mining and Warehousing	DEC	3	0	0	3	3
8	23AD049	Ethics of AI	DEC	3	0	0	3	3

VERTICAL 4: CYBER SECURITY & DATA PRIVACY

SL. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1	23CB031	Ethical Hacking	DEC	2	0	2	4	3
2	23CB032	Digital and Mobile Forensics	DEC	2	0	2	4	3
3	23CB033	Social Network Security	DEC	2	0	2	4	3
4	23CB034	Security in Computing	DEC	2	0	2	4	3
5	23CB035	Applied Cryptography	DEC	2	0	2	4	3
6	23CB036	Privacy Preserving Data Mining	DEC	2	0	2	4	3
7	23CB037	Malware Analysis	DEC	2	0	2	4	3
8	23CB038	Intrusion Detection, Prevention and Key Management Techniques	DEC	2	0	2	4	3

VERTICAL 5: EMERGING TECHNOLOGIES

SL. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1	23CS044	AR VR Technology	DEC	2	0	2	4	3
2	23CS045	Quantum Computing	DEC	2	0	2	4	3
3	23CB039	Mobile Computing Techniques	DEC	2	0	2	4	3
4	23CS046	Game Development	DEC	2	0	2	4	3
5	23CB040	Cryptocurrency	DEC	2	0	2	4	3
6	23CB041	Ad-hoc and Senor Networks	DEC	2	0	2	4	3
7	23CS048	Computer Vision and Applications	DEC	2	0	2	4	3
8	23AD047	Robotic Process Automation	DEC	2	0	2	4	3

NON-DEPARMENT ELECTIVE

EMERGING TECHNOLOGY

SL NO	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK L	T	P	TOTAL CONTACT PERIODS	CREDITS
1	23NE975	IoT concepts and applications	NEC	3	0	0	3	3
2	23NE980	Renewable Energy Systems	NEC	3	0	0	3	3
3	23NE982	Resource Management Techniques	NEC	3	0	0	3	3
4	23NE983	Aviation Management	NEC	3	0	0	3	3
5	23NE986	Foundation of Robotics	NEC	3	0	0	3	3
6	23NE987	Space Engineering	NEC	3	0	0	3	3
7	23NE988	Electric and Hybrid Vehicles	NEC	3	0	0	3	3
8	23NE989	Wearable Devices	NEC	3	0	0	3	3

MANAGEMENT COURSES

SL NO	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK L	T	P	TOTAL CONTACT PERIODS	CREDITS
1	23HS971	Total Quality Management	NEC	3	0	0	3	3
2	23HS972	Engineering Economics and Financial Accounting	NEC	3	0	0	3	3
3	23HS973	Engineering Management and Law	NEC	3	0	0	3	3
4	23HS974	Knowledge Management	NEC	3	0	0	3	3
5	23HS975	Industrial Management	NEC	3	0	0	3	3
6	23HS976	Entrepreneurship and Business Opportunities	NEC	3	0	0	3	3
7	23HS977	Modern Business Administration and Financing	NEC	3	0	0	3	3
8	23HS978	Essentials of Management	NEC	3	0	0	3	3

SAFETY COURSES

SL NO	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1	23HS979	Disaster Management	NEC	3	0	0	3	3
2	23HS980	Industrial Safety	NEC	3	0	0	3	3
3	23HS981	Automotive Safety	NEC	3	0	0	3	3

SEMESTER-WISE CREDIT DISTRIBUTION

SEMESTER	HSMC	BSC	ESC	PCC	DEC	NEC	EEC	TOTAL
Semester I	5+1*	11	6					22
Semester II	4	7	9	5			1*	25
Semester III	3	4	0	18			1*	25
Semester IV		4		20			1+1*	25
Semester V			2	9	6	3	2+1*	22
Semester VI			5	7	6	3	3	24
Semester VII			2	4	6	3	5	20
Semester VIII							10	10
TOTAL	12	26	24	63	18	9	21	173

23MA202 DISCRETE MATHEMATICS

L	T	P	C
3	1	0	4

COURSE OBJECTIVES:

- To develop student‘s logical and mathematical maturity and ability to deal with abstraction.
- To introduce most of the basic terminologies used in computer science related courses and application of ideas to solve practical problems.
- To understand the basic concepts of combinatorics and graph theory.
- To familiarize the applications of algebraic structures.
- To understand the concepts and significance of Lattices and Boolean algebra which are widely used in computer science and engineering.

UNIT I LOGIC AND PROOFS 9+3

Propositional logic – Propositional equivalences - Predicates and quantifiers – Nested quantifiers – Rules of inference - Introduction to proofs – Proof methods and strategy

UNIT II COMBINATORICS 9+3

Mathematical induction - The basics of counting - Well ordering -Strong induction – The pigeonhole principle – Permutations and Combinations – Recurrence relations - Solving linear recurrence relations – Generating functions – Inclusion and exclusion principle and its applications.

UNIT III GRAPHS 9+3

Graphs and graph models – Graph terminology and special types of graphs – Matrix representation of graphs and graph isomorphism – Connectivity – Euler and Hamilton paths.

UNIT IV LATTICES AND BOOLEAN ALGEBRA 9+3

Algebraic systems – Semi groups and monoids - Groups – Subgroups – Homomorphism‘s – Normal subgroup and cosets – Lagrange‘s theorem – Definitions and examples of Rings and Fields.

UNIT V Z-TRANSFORMS AND DIFFERENCE EQUATIONS 9+3

Partial ordering – Posets – Lattices as posets – Properties of lattices - Lattices as algebraic systems – Sub lattices – Direct product and homomorphism – Some special lattices – Boolean algebra – Boolean Homomorphism.

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TOTAL: 60 PERIODS

COURSE OUTCOMES:

At the end of the course the students will be able to

CO1: Apply the concepts of propositional and predicate calculus to the given logical statements needed for computing skill

CO2: Apply the idea of mathematical induction, pigeon-hole principle, inclusion and exclusion principle, permutation and combinations, recurrence relations and generating functions in combinatorial problems

CO3: Analyze the solutions for various engineering problems using graphs

CO4: Apply the concepts and properties of algebraic structures such as semi groups, monoids and groups needed in areas like formal languages and design fast adders, error-detecting codes and error-correcting codes

CO5: Identify the lattice structure using its properties

CO6: Apply Boolean expressions in areas like computational theory.

TEXT BOOKS:

1. Rosen. K.H., "Discrete Mathematics and its Applications", 7th edition, Tata McGraw Hill Pub. Co. Ltd., New Delhi, Special Indian Edition, 2017.
2. Tremblay. J.P. and Manohar. R, "Discrete Mathematical Structures with Applications to Computer Science", Tata McGraw Hill Pub. Co. Ltd, New Delhi, 30th Reprint, 2011.

REFERENCE BOOKS:

1. Dr.P.Sivaramakrishnadas, Dr.C.Vijayakumari, 'Discrete Mathematics' Pearson Publications
2. Grimaldi. R.P. "Discrete and Combinatorial Mathematics: An Applied Introduction", 5thEdition, Pearson Education Asia, Delhi, 2013.
3. Koshy. T. "Discrete Mathematics with Applications", Elsevier Publications, 2006.
4. Lipschutz. S. and Mark Lipson., "Discrete Mathematics", Schaum's Outlines, Tata McGraw Hill Pub. Co. Ltd., New Delhi, 3rd Edition, 2010.

COs	POs												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	3	2	1	-	-	-	-	-	-	-	-	-	3	-	-
2	3	2	2	-	-	-	-	-	-	-	-	-	3	-	-
3	3	3	2	-	-	-	-	-	-	-	-	-	3	-	-
4	3	2	1	-	-	-	-	-	-	-	-	-	3	-	-
5	3	2	1	-	-	-	-	-	-	-	-	-	3	-	-
6	3	2	1	-	-	-	-	-	-	-	-	-	3	-	-
Overall correlation	**3**	**3**	**2**	-	-	-	-	-	-	-	-	-	**3**	-	-

23CS301 OBJECT ORIENTED PROGRAMMING

L	T	P	C
3	0	0	3

COURSE OBJECTIVES:

- To understand Object Oriented Programming concepts and basics of Java Programming language
- To know the principles of packages, inheritance and interfaces
- To develop a Java application with threads and generics classes
- To define exceptions and use I/O streams
- To design and build Graphical User Interface Application using JAVAFX

UNIT I INTRODUCTION TO OOP AND JAVA **9**

Overview of OOP – Object Oriented Programming paradigms – Features of Object Oriented Programming – Java Buzzwords – Overview of Java – Data Types, Variables and Arrays – Operators – Control Statements – Programming Structures in Java – Defining classes in Java – Constructors-Methods -Access specifiers - Static members- Java Doc comments

UNIT II INHERITANCE, PACKAGES AND INTERFACES **9**

Overloading Methods – Objects as Parameters – Returning Objects –Static, Nested and Inner Classes. Inheritance: Basics– Types of Inheritance -Super keyword -Method Overriding – Dynamic Method Dispatch –Abstract Classes – final with Inheritance. Packages and Interfaces: Packages – Packages and Member Access –Importing Packages – Interfaces.

UNIT III EXCEPTION HANDLING AND MULTITHREADING **9**

Exception handling basics – Multiple catch Clauses – Nested try Statements – Java's Built-in Exceptions – User defined Exception. Multithreaded Programming: Java Thread Model–Creating a Thread and Multiple Threads – Priorities – Synchronization – Inter Thread Communication - Suspending –Resuming, and Stopping Threads – Multithreading. Wrappers – Auto boxing.

UNIT IV I/O, GENERICS, STRING HANDLING **10**

I/O Basics – Reading and Writing Console I/O – Reading and Writing Files. Generics: Generic Programming – Generic classes – Generic Methods – Bounded Types – Restrictions and Limitations. Strings: Basic String class, methods and String Buffer Class.

UNIT V JAVAFX EVENT HANDLING, CONTROLS, COMPONENTS **8**

JAVAFX Events and Controls: Event Basics – Handling Key and Mouse Events. Controls: Checkbox, ToggleButton – RadioButtons – ListView – ComboBox – ChoiceBox – Text Controls – ScrollPane. Layouts – FlowPane – HBox and VBox – BorderPane – StackPane – GridPane. Menus – Basics – Menu – Menu bars – MenuItem.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

At the end of the course the students will be able to

CO1: Apply the concepts of classes and objects to solve simple problems

CO2: Develop programs using packages and interfaces

CO3: Construct programs using inheritance concepts.

CO4: Make use of exception handling mechanisms and multithreaded model to solve real world problems

CO5: Build Java applications with I/O packages, string classes, Collections and generics concepts

CO6: Integrate the concepts of event handling and JavaFX components and controls for developing GUI based application

TEXT BOOKS:

1. Herbert Schildt, "Java: The Complete Reference", 11th Edition, McGraw Hill Education, New Delhi, 2019
2. Herbert Schildt, "Introducing JavaFX 8 Programming", 1st Edition, McGraw Hill Education, New Delhi, 2015

REFERENCE BOOK:

Cay S. Horstmann, "Core Java Fundamentals", Volume 1, 11th Edition, Prentice Hall, 2018.

COs	POs												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	2	1	2	1	3	-	-	-	-	-	-	1	3	1	1
2	2	1	2	2	1	-	-	-	-	-	-	2	3	3	1
3	3	3	1	2	2	-	-	-	-	-	-	2	3	1	1
4	3	1	2	2	2	-	-	-	-	-	-	1	3	1	1
5	2	1	2	3	2	-	-	-	-	-	-	1	3	3	1
6	3	2	1	1	2	-	-	-	-	-	-	1	3	1	1
Overall correlation	3	2	1	1	1	-	-	-	-	-	-	1	3	3	1

23CB301	DATABASE MANAGEMENT SYSTEMS AND SECURITY	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To learn the fundamentals of data models, conceptualize and depict a database system using ER diagram.
- To study the principles to be followed to create an effective relational database and write SQL queries to store/retrieve data to/from database systems.
- To know the fundamental concepts of transaction processing, concurrency control techniques and recovery procedure.
- To learn about the need of storage in Database Management systems.
- To Learn how to secure Database Management systems

UNIT I RELATIONAL DATABASES **9**

Purpose of Database System – Views of Data – Data Models – Database System Architecture – Introduction to Relational Databases – Relational Model – Keys – Relational Algebra – Relational Calculus – SQL Fundamentals – Advanced SQL features – Triggers – Embedded SQL

UNIT II DATABASE DESIGN **9**

Entity-Relationship Model – Mapping Entity Relationship Diagrams – Functional Dependencies – Non-Loss Decomposition Functional Dependencies – First Normal Form – Second Normal Form – Third Normal Form – Dependency Preservation – Boyce/Codd Normal Form – Multi-Valued Dependencies and Fourth Normal Form – Join Dependencies and Fifth Normal Form.

UNIT III TRANSACTION MANAGEMENT **9**

Transaction Concepts – ACID Properties – Serializability – Transaction Isolation Levels – Concurrency Control – Need for Concurrency – Lock-Based Protocols – Deadlock Handling -Recovery System – Failure Classification – Recovery Algorithm.

UNIT IV STORAGE AND QUERY PROCESSING **9**

RAID – File Organization – Organization of Records in Files – Indexing and Hashing – Ordered Indices – B+ tree Index Files – B tree Index Files – Static Hashing – Dynamic Hashing – Query Processing Overview – Query optimization using Heuristics and Cost Estimation.

UNIT V DATABASE SECURITY **9**

Database Security: Security issues -SQL Injection –SQLi Attack Avenues and Types- DBMS Access control based on privileges – Role Based access control –Cascading authorization–Statistical Database security – Flow control – Encryption and Public Key infrastructures – Challenges.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

At the end of the course the students will be able to

CO1: Explain the concepts of Database Management Systems and Apply SQL Queries Using relational Algebra

CO2: Apply conceptual modeling to real world applications and design database schemas

CO3: Demonstrate an understanding of normalization theory and apply such knowledge to the normalization of a database.

CO4: Explain the concepts of Transaction Processing and maintain consistency of the database.

CO5: Explain the need of storage in Database Management systems.

CO6: Learn how to secure Database Management systems.

TEXT BOOKS:

1. Abraham Silberschatz, Henry F. Korth, S. Sudharshan,"Database System Concepts", Seventh Edition, Tata McGraw Hill, 2019.
2. Ramez Elmasri, Shamkant B. Navathe, "Fundamentals of Database Systems", Seventh Edition, Pearson Education, 2021.
3. Alfred Basta,Melisaa Zgola,Dana Bullaboy,Thomas L WhitLock Sr, "Database Security",Course Technology,Cenage Learning 2012.

REFERENCE BOOKS:

1. C. J. Date, A. Kannan, S. Swamynathan, "An Introduction to Database Systems", Eighth Edition, Pearson Education, 2006.
2. Raghu Ramakrishnan, Johannes Gehrke, "Database Management Systems", Fourth Edition, Tata McGraw Hill, 2010.
3. G. K. Gupta, "Database Management Systems", Tata McGraw Hill, 2011.
4. Carlos Coronel, Steven Morris, Peter Rob," Design Implementation and Management", Ninth Edition, Cengage Learning,2011

COs	**POs**												**PSOs**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
1	2	2	3	2	1	-	-	-	2	1	1	2	2	1	-
2	3	1	3	1	1	-	-	-	2	1	3	2	3	1	-
3	3	2	3	2	1	-	-	-	2	1	-1	2	3	1	-
4	1	2	2	2	-	-	-	-	2	1	1	1	1	-	-
5	1	1	2	2	-	-	-	-	1	1	-	1	1	-	-
6	2	1	3	2	1	-	-	-	-	1	-	2	2	1	-
Overall Correlation	2	2	3	2	1	-	-	-	2	1	1	2	2	1	-

23HS301 UNIVERSAL HUMAN VALUES AND ETHICS

L	T	P	C
3	0	0	3

COURSE OBJECTIVES:

- Development of a holistic perspective based on self-exploration about themselves (human being), family, society and nature/existence.
- Understanding (or developing clarity) of the harmony in the human being, family, society and nature/existence.
- Strengthening of self-reflection.
- Development of commitment and courage to act.

UNIT I COURSE INTRODUCTION 9

Need, Basic Guidelines, Content and Process for Value Education - Understanding the need, basic guidelines, content and process for Value Education -Self Exploration–what is it? - its content and process; 'Natural Acceptance' and Experiential Validation- as the mechanism for self exploration - Continuous Happiness and Prosperity- A look at basic Human Aspirations -Right understanding, Relationship and Physical Facilities- the basic requirements for fulfilment of aspirations of every human being with their correct priority -Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario -Method to fulfil the above human aspirations: understanding and living in harmony at various levels.

UNIT II UNDERSTANDING HARMONY IN THE HUMAN BEING 9

Harmony in Myself- Understanding human being as a co-existence of the sentient 'I' and the material 'Body' -Understanding the needs of Self ('I') and 'Body' - Sukh and Suvidha- Understanding the Body as an instrument of 'I' (I being the doer, seer and enjoyer) - Understanding the characteristics and activities of 'I' and harmony in 'I' -Understanding the harmony of I with the Body: Sanyam and Swasthya; correct appraisal of Physical needs, meaning of Prosperity.

UNIT III UNDERSTANDING HARMONY IN THE FAMILY AND SOCIETY 9

Harmony in Human-Human Relationship -Understanding Harmony in the family – the basic unit of human interaction -Understanding values in human-human relationship; meaning of Nyaya and program for its fulfilment to ensure satisfaction; Trust(Vishwas) and Respect as the foundational values of relationship -Understanding the meaning of Vishwas; Difference between intention and competence -Understanding the meaning of Samman, Difference between respect and differentiation; the other salient values in relationship -Understanding the harmony in the society (society being an extension of family)-Visualizing a universal harmonious order in society- Undivided Society (Akhand Samaj), Universal Order- from family to world family.

UNIT IV ENGINEERING ETHICS **9**

Senses of ‗Engineering Ethics„ – Variety of moral issues – Types of inquiry – Moral dilemmas – Moral Autonomy – Kohlberg's theory – Gilligan's theory – Consensus and Controversy – Models of professional roles - Theories about right action – Self-interest – Customs and Religion – Uses of Ethical Theories.

UNIT V SAFETY, RESPONSIBILITY AND RIGHTS **9**

Safety and Risk – Assessment of Safety and Risk – Risk Benefit Analysis and Reducing Risk - Respect for Authority – Collective Bargaining – Confidentiality – Conflicts of Interest – Occupational Crime – Professional Rights – Employee Rights – Intellectual Property Rights (IPR) – Discrimination-Moral Leadership –Code of Conduct – Corporate Social Responsibility.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

At the end of the course the students will be able to

CO1: Understand the need of value education.

CO2: Comprehend the difference between self and body.

CO3: Understand the need to exist as an unit of Family and society.

CO4: Understand Harmony at all levels.

CO5: Apply the values acquired in the professional front.

CO6: Identify appropriate technologies for ecofriendly production systems.

TEXT BOOKS:

1. Human Values and Professional Ethics by R R Gaur, R Sangal, G P Bagaria, Excel Books, New Delhi, 2010 3.
2. Mike W. Martin and Roland Schinzinger, ―Ethics in Engineering‖, Tata McGraw Hill, New Delhi, 2003.
3. Govindarajan M, Natarajan S, Senthil Kumar V. S, ―Engineering Ethics‖, Prentice Hall of India, New Delhi, 2004

REFERENCE BOOKS:

1. Jeevan Vidya: Ek Parichaya, A Nagaraj, Jeevan Vidya Prakashan, Amarkantak, 1999.
2. Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004.
3. The Story of Stuff (Book).
4. The Story of My Experiments with Truth - by Mohandas Karamchand Gandhi AICTE Model Curriculum in Humanities, Social Science and Management Courses (UG Engineering & Technology) 169 | Page .
5. Small is Beautiful - E. F Schumacher.
6. Slow is Beautiful - Cecile Andrews.
7. Economy of Permanence - J C Kumarappa 8. Bharat Mein Angreji Raj – Pandit Sunderlal.

8. Rediscovering India - by Dharampal.
9. Hind Swaraj or Indian Home Rule - by Mohandas K. Gandhi .
10. India Wins Freedom - Maulana Abdul Kalam Azad.
11. Vivekananda - Romain Rolland (English) 13. Gandhi - Romain Rolland (English).
12. Charles B. Fleddermann, ―Engineering Ethics‖, Pearson Prentice Hall, New Jersey, 2004.
13. Charles E. Harris, Michael S. Pritchard and Michael J. Rabins, ―Engineering Ethics – Concepts and Cases‖, Cengage Learning, 2009.

WEB SOURCES:

1. www.onlineethics.org
2. www.nspe.org
3. www.globalethics.org

COs	POs												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	-	-	-	-	-	3	3	3	3	3	-	-	-	-	3
2	-	-	-	-	-	3	3	3	3	3	-	-	-	-	3
3	-	-	-	-	-	3	3	3	3	3	-	-	-	-	3
4	-	-	-	-	-	3	3	3	3	3	-	-	-	-	3
5	-	-	-	-	-	3	3	3	3	3	-	-	-	-	3
6	-	-	-	-	-	3	3	3	3	3	-	-	-	-	3
Overall correlation	-	-	-	-	-	3	3	3	3	3	-	-	-	-	3

23CB311	DIGITAL PRINCIPLES AND COMPUTER ORGANIZATION	L	T	P	C
		3	0	2	4

COURSE OBJECTIVES:

- To analyze and design combinational circuits.
- To analyze and design sequential circuits
- To learn the basic structure and operation of a digital computer.
- To study the design of data path unit, control unit for processor and hazards
- To learn the concept of various memories and I/O interfacing.

UNIT I COMBINATIONAL LOGIC 9

Combinational Circuits – Karnaugh Map – Half and full Adder – Subtractors – Binary parallel adder - Magnitude Comparator – Decoder – Encoder – Multiplexers – Demultiplexers, Code converters

UNIT II SYNCHRONOUS SEQUENTIAL LOGIC 9

Flip-Flops – operation and excitation tables, Triggering of FF, Analysis and design of clocked sequential circuits – Design – Moore/Mealy models, state minimization, state assignment, - Registers – Counters- Ripple counters

UNIT III COMPUTER FUNDAMENTALS 9

Functional Units of a Digital Computer: Von Neumann Architecture – Operation and Operands of Computer Hardware Instruction – Instruction Set Architecture (ISA):– Instruction and Instruction Sequencing – Addressing Modes, Encoding of Machine Instruction – Interaction between Assembly and High Level Language.

UNIT IV PROCESSOR 9

Instruction Execution – Building a Data Path – Designing a Control Unit – Hardwired Control, Microprogrammed Control – Pipelining – Data Hazard – Control Hazards.

UNIT V MEMORY AND PROGRAMMABLE LOGIC 9

Memory Concepts and Hierarchy – Memory Management – Cache Memories: Mapping and Replacement Techniques – Virtual Memory – DMA – ROM-Programmable Logic Array-Programmable Array logic.

TOTAL: 45 PERIODS

PRACTICAL EXERCISES: 30 PERIODS

1. Verification of Boolean theorems using logic gates.
2. Design and implementation of combinational circuits using gates for arbitrary functions.
3. Implementation of 4-bit binary adder/subtractor circuits.
4. Implementation of code converters.
5. Implementation of BCD adder, encoder and decoder circuits
6. Implementation of functions using Multiplexers.
7. Implementation of the synchronous counters
8. Implementation of a Universal Shift register.
9. Simulator based study of Computer Architecture

COURSE OUTCOMES:

At the end of the course the students will be able to

CO1: Develop digital fundamentals using number systems, logic gates, Boolean algebra and Karnaugh map.

CO2: Build various combinational circuits using logic gates

CO3: Construct sequential circuits such as flip flops, counters and registers.

CO4: Interpret the functional units of computers, instruction set and addressing modes

CO5: Explain the various functional units of processor, pipelining and hazards.

CO6: Compare the various memory concepts of the processor and programmable logic devices

TOTAL: 45 + 30 = 75 PERIODS

TEXT BOOKS:

1. M. Morris Mano, Michael D. Ciletti, "Digital Design : With an Introduction to the Verilog HDL, VHDL, and System Verilog", Sixth Edition, Pearson Education, 2018.
2. David A. Patterson, John L. Hennessy, "Computer Organization and Design, The Hardware/Software Interface", Sixth Edition, Morgan Kaufmann/Elsevier, 2020.

REFERENCE BOOKS:

1. Floyd T.L., "Digital Fundamentals", Charles E., Eleventh edition Pearson,2019.
2. Charles H. Roth, Jr, 'Fundamentals of Logic Design', Jaico Books, 7th Edition, 2021.
3. M. Morris Mano, "Digital Logic and Computer Design", Pearson Education, 2016
4. Carl Hamacher, Zvonko Vranesic, Safwat Zaky, Naraig Manjikian, "Computer Organization and Embedded Systems", Sixth Edition, Tata McGraw-Hill, 2012.
5. William Stallings, "Computer Organization and Architecture – Designing for Performance", Tenth Edition, Pearson Education, 2016.

COs	POs												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	3	2	1	1	1	-	-	-	2	1	-	2	3	1	-
2	3	2	1	1	1	-	-	-	2	1	-	-	3	1	-
3	2	2	-	-	1	-	-	-	2	1	-	2	2	1	-
4	2	2	-	-	1	1	-	-	3	2	-	2	2	1	-
5	2	1	-	-	1	-	1	-	2	1	-	-	2	1	-
6	2	1	-	-	1	1	-	-	2	1	-	2	3	1	-
Overall correlation	3	2	1	1	2	1	1	-	3	2	-	2	3	2	-

23CS312 DESIGN AND ANALYSIS OF ALGORITHMS

L	T	P	C
3	0	2	4

COURSE OBJECTIVES:

- To understand and apply the algorithm analysis techniques on searching and sorting algorithms
- To critically analyze the efficiency of graph algorithms
- To understand different algorithm design techniques
- To solve programming problems using state space tree
- To understand the concepts behind NP Completeness, Approximation algorithms and randomized algorithms

UNIT I INTRODUCTION 9

Time and space complexity - Asymptotic Notations – Solving Recurrences: substitution method - Lower bounds - hash function - searching: linear search, binary search and Interpolation Search, String Matching: The naïve string - matching algorithm - Rabin-Karp algorithm - Sorting: Insertion sort, heap sort

UNIT II GRAPH ALGORITHMS 9

Representations of graphs - Graph traversal: DFS - BFS - Minimum spanning tree: Kruskal's and Prim's algorithm - Shortest path: Bellman - Ford algorithm - Dijkstra's algorithm - Maximum flow: Flow networks - Ford-Fulkerson method - Maximum bipartite matching.

UNIT III ADVANCED DESIGN AND ANALYSIS TECHNIQUES 9

Divide and Conquer methodology: Merge sort - Quick sort- Dynamic programming: Elements of dynamic programming - Matrix-chain multiplication - Multi stage graphs. Greedy Technique: Elements of the greedy strategy - Activity-selection problem - Huffman Trees

UNIT IV STATE SPACE SEARCH ALGORITHMS 9

Backtracking : n-Queens problem - Hamiltonian Circuit Problem - Subset Sum Problem - Graph colouring problem Branch and Bound : Solving 15-Puzzle problem - Assignment problem - Knapsack Problem - Travelling Salesman Problem.

UNIT V NP-COMPLETE AND APPROXIMATION ALGORITHM 9

Tractable and intractable problems: Polynomial time algorithms - Venn diagram representation – Non Deterministic algorithms - NP-hardness and NP-completeness - Problem reduction: TSP - 3 CNF problem. Approximation Algorithms: Bin Packing problem - Randomized Algorithms: concept and application - primality testing - randomized quick sort.

TOTAL: 45 PERIODS

PRACTICAL EXERCISES: 30 PERIODS

1. Sort a given set of elements using the Quick sort method and determine the time required to sort the elements. Repeat the experiment for different values of n, the number of elements in the list to be sorted. The elements can be read from a file or can be generated using the random number generator.
2. Implement a Merge Sort algorithm to sort a given set of elements and determine the time required to sort the elements. Repeat the experiment for different values of n, the number of elements in the list to be sorted. The elements can be read from a file or can be generated using the random number generator.
3. (A) Obtain the Topological ordering of vertices in a given digraph. (B) Compute the transitive closure of a given directed graph using Warshall's algorithm.
4. Implement 0/1 Knapsack problem using Dynamic Programming.
5. From a given vertex in a weighted connected graph, find shortest paths to other vertices using Dijikstra’s algorithm
6. Find Minimum Cost Spanning Tree of a given undirected graph using Kruskal’s algorithm.
7. (A) Print all the nodes reachable from a given starting node in a digraph using BFS method. (B) Check whether a given graph is connected or not using DFS method.
8. Find a subset of a given set S = {s1, s2,….., sN} of n positive integers whose sum is equal to a given positive integer d. For example, if S= {1, 2, 5, 6, 8} and d = 9 there are two solutions {1,2,6}and{1,8}.A suitable message is to be displayed if the given problem instance doesn't have a solution.
9. Implement any scheme to find the optimal solution for the Traveling Salesperson problem and then solve the same problem instance using any approximation algorithm and determine the error in the approximation.
10. Find Minimum Cost Spanning Tree of a given undirected graph using Prim’s algorithm.
11. Implement All-Pairs Shortest Paths Problem using Floyd's algorithm.
12. Implement N Queen's problem using Back Tracking

COURSE OUTCOMES:

At the end of the course the students will be able to

CO1: Apply first law of thermodynamics to solve problems related to open and closedsystems

CO2: Apply the second law of thermodynamics to Engineering devices.

CO3: Estimate the efficiency and performance of various air standard cycles

CO4: Determine efficiency and performance of vapor power cycle.

CO5: Calculate thermodynamics problems related to conduction, convention andradiation

CO6: Determine the jet engine performance by applying thermodynamics properties.

TEXT BOOKS:

1. Nag. P. K., "Engineering Thermodynamics", 6th Edition, Tata McGraw-Hill,New Delhi, 2017.
2. Cengel, Y, M. Boles and M. Kanoğlu, Thermodynamics - An Engineering Approach, Tata McGraw Hill,8th Edition, 2015.
3. Holman.J.P., "Thermodynamics", 3rd Edition, McGraw-Hill, 2007

REFERENCE BOOKS:

1. Anany Levitin, "Introduction to the Design and Analysis of Algorithms", 3rd Edition, Pearson Education, 2012.
2. Alfred V. Aho, John E. Hopcroft and Jeffrey D. Ullman, "Data Structures and Algorithms", Reprint Edition, Pearson Education, 2006.
3. S. Sridhar, "Design and Analysis of Algorithms", Oxford university press, 2014.

COs	**POs**												**PSOs**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
1	3	2	1	1	1	-	-	1	1	1	1	2	2	1	-
2	3	2	1	1	1	-	-	1	1	1	1	2	3	1	-
3	3	2	1	1	1	-	-	1	1	1	1	2	3	1	-
4	3	2	1	1	-	-	-	1	1	1	1	1	1	-	-
5	3	2	1	1	-	-	-	1	1	1	-	1	1	-	-
6	3	2	1	1	1	-	-	1	1	1	-	2	2	1	-
Overall correlation	3	2	1	1	1	-	-	1	1	1	1	2	2	1	-

23CS321	**OBJECT ORIENTED PROGRAMMING LABORATORY**	**L**	**T**	**P**	**C**
		0	**0**	**4**	**2**

COURSE OBJECTIVES:

- To build software development skills using java programming for real-world applications.
- To understand and apply the concepts of classes, packages, interfaces, inheritance, exception handling and file processing.
- To develop applications using generic programming and event handling

LIST OF EXPERIMENTS

1. Solve problems by using sequential search, binary search, and quadratic sorting algorithms (selection, insertion)
2. Develop stack and queue data structures using classes and objects.
3. Develop a java application with an Employee class with Emp_name, Emp_id, Address, Mail_id, Mobile_no as members. Inherit the classes, Programmer, Assistant Professor, Associate Professor and Professor from employee class. Add Basic Pay (BP) as the member of all the inherited classes with 97% of BP as DA, 10 % of BP as HRA, 12% of BP as PF, 0.1% of BP for staff club funds. Generate pay slips for the employees with their gross and net salary.
4. Write a Java Program to create an abstract class named Shape that contains two integers and an empty method named printArea(). Provide three classes named Rectangle, Triangle and Circle such that each one of the classes extends the class Shape. Each one of the classes contains only the method printArea( ) that prints the area of the given shape.
5. Solve the above problem using an interface.
6. Implement exception handling and creation of user defined exceptions.
7. Write a java program that implements a multi-threaded application that has three threads. First thread generates a random integer every 1 second and if the value is even, the second thread computes the square of the number and prints. If the value is odd, the third thread will print the value of the cube of the number.
8. Write a program to perform file operations.
9. Develop applications to demonstrate the features of generics classes.
10. Develop applications using JavaFX controls, layouts and menus.
11. Develop a mini project for any application using Java concepts.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

At the end of the course the students will be able to

CO1 : Design and develop java programs using object oriented programming concepts

CO2: Construct the java program in inheritance concepts.

CO3: Develop simple applications using object oriented concepts such as package, exceptions

CO4 : Implement multithreading, and generics concepts

CO5: Create GUIs and event driven programming applications for real world problems

CO6: Implement and deploy web applications using Java

COs	POs												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	3	2	1	1	2	-	-	1	1	1	-	1	2	2	-
2	3	2	1	1	1	-	-	1	1	1	-	1	3	2	-
3	2	1	1	1	2	-	-	1	1	1	-	1	2	1	-
4	2	1	1	1	1	-	-	1	1	1	-	1	2	1	-
5	3	1	1	1	1	-	-	1	1	1	-	1	2	1	-
6	3	1	1	1	1	-	-	1	1	1	-	1	2	1	-
Overall correlation	3	2	1	1	2	-	-	1	1	1	-	1	3	2	-

23CB321	DATABASE MANAGEMENT SYSTEMS AND SECURITY LABORATORY	L	T	P	C
		0	0	4	2

COURSE OBJECTIVES:

- To learn and implement important commands in SQL.
- To learn the usage of nested and joint queries.
- To understand functions, procedures and procedural extensions of databases.
- To understand attacks on databases and to learn to defend against the attacks on databases.
- To learn to store and retrieve encrypted data in databases.

LIST OF EXPERIMENTS

1. Create a database table, add constraints (primary key, unique, check, Not null), insert rows, update and delete rows using SQL DDL and DML commands.
2. Query the database tables using different 'where' clause conditions and also implement aggregate functions.
3. Query the database tables and explore sub queries and simple join operations.
4. Write user defined functions and stored procedures in SQL.
5. Create View and index for database tables with a large number of records.
6. Write program that use SQLi to authenticate as administrator, to get unauthorized access over sensitive data, to inject malicious statements into form field.
7. Write a program that will defend against the SQLi attacks given in the previous exercise.
8. Write queries to insert encrypted data into the database and to retrieve the data using decryption.
9. Write queries to find all permissions and access control for all users in database.
10. Implement Role Based access control in Database.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

At the end of the course the students will be able to

CO1: Create databases with different types of key constraints.

CO2: Construct simple and complex sub queries and join queries.

CO3: Demonstrate advanced features such as stored procedures and triggers

CO4: Identify attacks on databases and to learn to defend against the attacks on databases.

CO5: Implement to store and retrieve encrypted data in databases.

CO6: Apply the concepts of encryption in Database.

COs	POs												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	3	3	3	3	3	-	-	-	3	1	3	2	2	3	-
2	3	3	3	3	3	-	-	-	1	2	3	3	2	1	-
3	3	3	2	2	3	-	-	-	1	1	1	3	2	3	-
4	1	3	3	3	3	-	-	-	1	1	3	2	3	1	-
5	3	2	2	2	3	-	-	-	2	2	3	1	3	1	-
6	3	3	3	3	3	-	-	-	1	2	2	1	1	2	-
Overall Correlation	3	3	3	2	3	-	-	-	2	1	3	2	2	2	-

23ES391 PRESENTATION SKILLS

L	T	P	C
0	0	2	1*

COURSE OBJECTIVES:

- To help learners use brainstorming techniques for generating, organizing and outlining ideas.
- To familiarize learners with different speech structures by engaging them in watching speeches with great opening and closing
- To give practice on voice modulation and use of body language and eye contact for making captivating presentations
- To give hands on training on preparing presentation slides and using remote presentation tools
- To train students on responding to question and feedback with confidence.

UNIT I BRAINSTORMING AND OUTLINING 6

Mind Mapping based on prior knowledge, collecting additional information from external resources, giving prompts to Generative AI tools seeking information, organizing ideas generated, knowing your audience

UNIT II STRUCTURING THE PRESENTATION 6

3 Ts of a presentation, writing effective introduction- Beginning the introduction with a hook (question, data, storytelling) and closing the introduction with the objective of the presentation. Structuring the body paragraphs -Choosing key ideas from the list of ideas generated during brainstorming. Substantiating ideas with examples, data, reasons and anecdotes. Summarizing the ideas for conclusion.

UNIT III DELIVERY TECHNIQUES 6

Vocal variety, intonation, reducing filler words and improving articulation, inflection, engaging the audience. Body language- eye contact, gestures, movement on stage.

UNIT IV USE OF TECHNOLOGICAL AIDS 6

Use of presentation software like MS Power Point, Google Slides etc, incorporating images, graphs, charts and videos, using interactive tools like quizzes and polls, using remote presentation tools like zoom, MS Teams, WebEx for screen sharing, virtual whiteboards and chat functionalities, incorporating AR/VR for more immersive presentations .

UNIT V HANDLING QUESTIONS AND FEEDBACK 6

Audience engagement through questions, PAR (Point, Answer, Redirect) strategy for structuring responses to questions. Understanding feedback process - Receiving, interpreting and evaluating constructively, active listening techniques for processing feedback, responding to feedback- acknowledging, clarifying and appreciating, Dealing with challenging feedback.

TOTAL: 30 PERIODS

COURSE OUTCOMES:

After completion of the course, the students should be able to

CO1 construct ideas for presentation through mind mapping techniques

CO2 organize ideas and structure the presentation with captivating introduction, body paragraphs illustrated with examples and reasons and compelling conclusion

CO3 apply vocal variety and body language techniques to enhance delivery

CO4 prepare engaging presentations by integrating multimedia elements

CO5 demonstrate proficiency in delivering presentations in remote platforms utilizing various technological tools and strategies to engage audience in virtual environments

CO6 exhibit active listening skills by responding to questions with clarity and confidence and incorporating constructive feedback for professional development

TEXT BOOKS:

1. "Slide:ology: The Art and Science of Creating Great Presentations" by Nancy Duarte. O'Reilly Media
2. "The Naked Presenter: Delivering Powerful Presentations With or Without Slides" by Garr Reynolds. New Riders

REFERENCE BOOK:

Talk Like TED: The 9 Public-Speaking Secrets of the World's Top Minds" by Carmine Gallo.

23MA301 LINEAR ALGEBRA

L	T	P	C
3	1	0	4

COURSE OBJECTIVES:

- To test the consistency and solve system of linear equations
- To find the basis and dimension of vector space
- To obtain the matrix of linear transformation and its eigenvalues and eigenvectors
- To find orthonormal basis of inner product space and find least square approximation
- To find eigenvalues of a matrix using numerical techniques and perform matrix decomposition.

UNIT I MATRICES AND SYSTEM OF LINEAR EQUATIONS 9+3

Matrices - Row echelon form - Rank - System of linear equations - Consistency - Gauss elimination method - Gauss Jordon method – Gauss Seidel Method

UNIT II VECTOR SPACES 9+3

Vector spaces - Subspace - Linear independence and dependence – Linear Span - Basis and dimension – Maximal Linearly Independent Subsets.

UNIT III LINEAR TRANSFORMATION 9+3

Linear transformation - Rank space and null space - Rank and nullity - Dimension theorem - Matrix representation of linear transformation - Eigenvalues and eigenvectors of linear transformation – Invertibility and Isomorphisms – Dual Spaces – Homogeneous Linear Differential Equations with Constant coefficients .

UNIT IV INNER PRODUCT SPACES 9+3

Inner product and norms - Properties - Orthogonal, Orthonormal vectors - Gram Schmidt orthonormalization process – Adjoint of Linear operator – Normal and self adjoint operators – Unitary and orthogonal operators and their Matrices

UNIT V EIGENVALUE PROBLEMS AND MATRIX DECOMPOSITION 9+3

Eigen value Problems - Power method, Jacobi rotation method - Singular value decomposition - QR decomposition – Generalized Inverse - Least square solution

TOTAL: 60 PERIODS

COURSE OUTCOMES:

At the end of the course the students will be able to

CO 1 Test the consistency and solve system of linear equations.

CO 2 Find the basis and dimension of vector space.

CO 3 Obtain the matrix of linear transformation and its eigenvalues and eigenvectors.

CO 4 Find orthonormal basis of inner product space and least square approximation.

CO 5 Find eigenvalues of a matrix using numerical techniques

CO 6 Perform Matrix Decomposition using different techniques

TEXT BOOKS:

1. Friedberg A.H, Insel A.J. and Spence L, "Linear Algebra", Prentice Hall of India, New Delhi, 2004.
2. Faires J.D. and Burden R., "Numerical Methods", Brooks/Cole (Thomson Publications), New Delhi, 2002.

REFERENCE BOOKS:

1. Kumaresan S, "Linear Algebra - A geometric approach", Prentice Hall of India, New Delhi, Reprint, 2010.
2. P.S.Das – "Numerical Analysis", Pearson Educations, New Delhi, 2002
3. Richard Branson, "Matrix Operations", Schaum's outline series, 1989.

COs	POs												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	3	2	2	-	-	-	-	-	-	-	-	-	-	-	2
2	3	2	2	-	-	-	-	-	-	-	-	-	-	-	2
3	3	2	2	-	-	-	-	-	-	-	-	-	-	-	2
4	3	2	2	-	-	-	-	-	-	-	-	-	-	-	2
5	3	2	2	-	-	-	-	-	-	-	-	-	-	-	2
6	3	2	2	-	-	-	-	-	-	-	-	-	-	-	2
Overall Correlation	3	2	2	-	-	-	-	-	-	-	-	-	-	-	2

23CB401 OPERATING SYSTEMS AND SECURITY

L	T	P	C
3	0	0	3

COURSE OBJECTIVES:

- To understand the basic concepts and functions of operating systems.
- To understand Processes and Threads
- To analyze Scheduling algorithms.
- To understand the concept of Deadlocks.
- To analyze various memory management schemes.
- To describe Security and Protection Mechanism in operating systems.
- To describe the concepts of trusted OS design.

UNIT I INTRODUCTION 10

Introduction to Operating Systems – Views of Operating system, Computer System organization, Computer System Architecture; **Operating System Structures** – Operating System Services - User Operating System Interface - System Calls – System Programs - Design and Implementation - Structuring methods; **Processes** - Process Concept, Process Scheduling, Operations on Processes, Inter-process Communication – Shared Memory Systems, Message Passing Systems, **Threads** - Multithread Models.

UNIT II PROCESS MANAGEMENT 9

CPU Scheduling – Basic Concepts, Scheduling criteria - Scheduling algorithms; **Process Synchronization** - The Critical-Section problem, Synchronization hardware, Mutex Locks, Semaphores, Monitors, Classical problems of synchronization; **Deadlock** – Deadlock Characterization, Methods for handling deadlocks, Deadlock prevention, Deadlock avoidance, Deadlock detection, Recovery from deadlock.

UNIT III MEMORY MANAGEMENT 9

Main Memory – Address Binding, Logical and Physical Address Space, Contiguous Memory Allocation, Segmentation, Paging, Structure of the Page Table; **Virtual Memory** - Demand Paging, Copy on Write, Page Replacement, Thrashing.

UNIT IV SECURITY AND PROTECTION 8

File System Interface – File Protection, File Sharing; **Security** - The Security Problem, Program Threats, System and Network Threats, Cryptography, User Authentication, Implementing Security Defenses; **Protection** – Goals, Principles, Protection Rings, Domain Protection, Access Matrix, Implementation of Access Matrix, Revocation of Access Rights, Role-Based Access Control, Mandatory Access Control, Capability-Based Systems, Protection Improvement Methods, Language-Based Protection.

UNIT V TRUSTED OS DESIGN 6

Security in Operating Systems – Operating System Structure, Security Features, Protected Objects, Tools to Implement Security Functions; **Security in the Design of Operating Systems** – Simplicity of Design, Layered Design, Kernelized Design, Reference Monitor, Correctness and Completeness, Secure Design Principles, Trusted Systems, Trusted System Functions.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

At the end of the course the students will be able to

- **CO1:** Explain operating system structures and various services provided by operating systems
- **CO2:** Apply Process synchronization, process scheduling, and deadlocks concepts in the given scenario to solve the problems.
- **CO3:** Apply algorithms and suitable techniques for memory management.
- **CO4:** Explain the concepts of securing the Operating Systems
- **CO5:** Explain the mechanisms to protect the Operating Systems
- **CO6:** Explain the concepts of designing a trusted operating system.

TEXT BOOKS:

1. Abraham Silberschatz, Peter Baer Galvin and Greg Gagne, "Operating System Concepts", 10th Edition, John Wiley and Sons Inc., 2018. (Units 1-4)
2. Charles P. Pfleeger, Shari Lawrence Pfleeger, Jonathan Margulies, "Security in Computing", 5th Edition, Prentice Hall, 2018. (Unit 5)

REFERENCE BOOKS:

1. Ramaz Elmasri, A. Gil Carrick, David Levine, "Operating Systems – A Spiral Approach", Tata McGraw Hill Edition, 2010.
2. William Stallings, "Operating Systems: Internals and Design Principles", 7th Edition, Prentice Hall, 2018.
3. Achyut S.Godbole, Atul Kahate, "Operating Systems", McGraw Hill Education, 2016.
4. Trent Jaeger, "Operating System Security ", Springer Cham, Springer Nature Switzerland AG 2008 – ISBN – 978-3-031-01205-1.

COs	**POs**												**PSOs**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
1	2	1	1	1	1	-	-	1	1	1	1	2	2	1	-
2	3	2	1	1	1	-	-	1	1	1	1	2	3	1	-
3	3	2	1	1	1	-	-	1	1	1	1	2	3	1	-
4	2	1	1	1	1	-	-	1	1	1	1	1	1	-	-
5	3	2	1	1	1	-	-	1	1	1	-	1	1	-	-
6	2	1	1	1	1	-	-	1	1	1	-	2	2	1	-
Overall Correlation	3	3	2	1	1	-	-	1	1	1	1	2	2	1	-

23CS402 ARTIFICIAL INTELLIGENCE

L	T	P	C
3	0	0	3

COURSE OBJECTIVES:

- To understand the various characteristics of intelligent agents
- To learn the different search strategies in AI
- To learn to represent knowledge in solving AI problems
- To understand the different ways of designing software agents
- To know about the various applications of AI.

UNIT I NTRODUCTION 9

Introduction–Definition - Future of Artificial Intelligence – Characteristics of Intelligent Agents– Typical Intelligent Agents – Problem Solving Approach to Typical AI problems.

UNIT II PROBLEM SOLVING METHODS 9

Problem solving Methods - Search Strategies- Uninformed - Informed - Heuristics - Local Search Algorithms and Optimization Problems - Searching with Partial Observations - Constraint Satisfaction Problems – Constraint Propagation - Backtracking Search - Game Playing - Optimal Decisions in Games – Alpha - Beta Pruning - Stochastic Games

UNIT III KNOWLEDGE REPRESENTATION 9

First Order Predicate Logic – Prolog Programming – Unification – Forward Chaining Backward Chaining – Resolution – Knowledge Representation - Ontological Engineering-Categories and Objects – Events - Mental Events and Mental Objects - Reasoning Systems for Categories - Reasoning with Default Information.

UNIT IV SOFTWARE AGENTS 9

Architecture for Intelligent Agents – Types and Characteristics of Agents-Agent communication – Negotiation and Bargaining – Argumentation among Agents – Trust and Reputation in Multi-agent systems.

UNIT V APPLICATIONS 9

AI applications – Language Models – Information Retrieval- Information Extraction – Natural Language Processing - Machine Translation – Speech Recognition – Robot – Hardware – Perception – Planning – Moving.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

At the end of the course the students will be able to

CO1: Use appropriate search algorithms for any AI problem.

CO2: Represent a problem using first order and predicate logic.

CO3: Provide the apt agent strategy to solve a given problem.

CO4: Develop a language/frameworks of different AI methods using Knowledge representation.

CO5: Design software agents to solve a problem.

CO6: Design applications for NLP that use Artificial Intelligence.

TEXT BOOKS:

1. S. Russell and P. Norvig, "Artificial Intelligence: A Modern Approach", Prentice Hall, Third Edition, 2009.
2. Bratko, "Prolog: Programming for Artificial Intelligence", Fourth edition, Addison Wesley Educational Publishers Inc., 2011.

REFERENCE BOOKS:

1. M. Tim Jones, "Artificial Intelligence: A Systems Approach (Computer Science)", Jones and Bartlett Publishers, Inc.; First Edition, 2008.
2. Nils J. Nilsson, "The Quest for Artificial Intelligence", Cambridge University Press, 2009
3. William F. Clocksin and Christopher S. Mellish, "Programming in Prolog: Using the ISO Standard", Fifth Edition, Springer, 2003
4. Gerhard Weiss, "Multi Agent Systems", Second Edition, MIT Press, 2013
5. David L. Poole and Alan K. Mackworth, "Artificial Intelligence: Foundations of Computational Agents", Cambridge University Press, 2010

COs	POs												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	3	1	1	3	1	1	1	1	3	3	2	1	3	3	1
2	2	3	1	3	2	1	1	1	1	2	2	2	1	2	1
3	1	3	3	2	2	1	1	1	2	3	1	2	1	3	1
4	1	2	3	3	1	1	1	1	3	2	1	3	3	3	1
5	1	2	3	2	1	2	2	2	2	1	1	1	3	2	1
Overall correlation	1	2	3	2	1	1	1	1	2	1	1	1	3	2	1

23CB402 INFORMATION SECURITY PRINCIPLES

L	T	P	C
3	0	0	3

COURSE OBJECTIVES:

- To Understand basics of Information Security
- To know the legal, ethical, and professional issues in Information Security
- To know the aspects of risk management
- To become aware of various standards in this area
- To know the technological aspects of Information Security

UNIT I INTRODUCTION 9

History, what is Information Security, Critical Characteristics of Information, NSTISSC Security Model, Components of an Information System, Securing the Components, Balancing Security and Access, Introduction- SDLC-SDLC Methodologies-Requirements -System Design-Implementation-Testing-Deployment-Maintenance and support

UNIT II SECURITY INVESTIGATION 9

Need for Security, Business Needs, Threats, Attacks, Legal, Ethical and Professional Issues - An Overview of Computer Security - Access Control Matrix, Policy-Security policies, Confidentiality policies, Integrity policies and Hybrid policies.

UNIT III SECURITY ANALYSIS 9

Risk Management: Identifying and Assessing Risk, Assessing and Controlling Risk - Systems: Access Control Mechanisms, Information Flow and Confinement Problem.

UNIT IV LOGICAL DESIGN 9

Blueprint for Security, Information Security Policy, Standards and Practices, ISO 17799/BS 7799, NIST Models, VISA International Security Model, Design of Security Architecture, Planning for Continuity.

UNIT V PHYSICAL DESIGN 9

Security Technology, IDS, Scanning and Analysis Tools, Cryptography, Access Control Devices, Physical Security, Security and Personnel.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

At the end of the course the students will be able to

CO1: Interpret the basics of information security

CO2: Illustrate the legal, ethical, and professional issues in information security

CO3: Demonstrate the aspects of risk management.

CO4: Explain various standards in the Information Security System

CO5: Design and implement Security Techniques

CO6: Explain security policies and protocols to implement such policies.

TEXT BOOKS:

1. Michael E Whitman and Herbert J Mattord, “Principles of Information Security,” Vikas Publishing House, New Delhi, 2003.
2. Mark Stamp, "Information Security: Principles and Practice," 3rd edition
3. Charles P. Pfleeger, Shari Lawrence Pfleeger, Jonathan Margulies, “Security in Computing”, 5th Edition, Prentice Hall, 2018. (Unit 5)

REFERENCE BOOKS:

1. Micki Krause, Harold F. Tipton, “Handbook of Information Security Management,” Vol 1-3 CRC Press LLC, 2004.
2. Stuart McClure, Joel Scrambray, George Kurtz, “Hacking Exposed,” Tata McGrawHill, 2003.
3. Matt Bishop, “Computer Security Art and Science,” Pearson/PHI, 2002.
4. Certified Information Systems Security Professional, Study Guide by Ed Tittle, Mike Chapple, James Michael Stewart, 6th Edition, Sybex Publication, 06 July 2012.

COs	**POs**												**PSOs**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
1	2	1	1	1	2	-	-	-	1	-	-	1	2	2	-
2	2	1	1	1	3	-	-	-	2	-	-	1	3	3	-
3	3	2	1	1	3	-	-	-	2	-	-	1	3	3	-
4	3	2	1	1	3	-	-	-	2	-	-	1	3	3	-
5	2	1	1	1	3	-	-	-	3	-	-	2	3	2	-
6	2	1	1	1	2	-	-	-	2	-	-	1	3	2	-
Overall correlation	3	2	1	1	3	-	-	-	3	-	-	2	3	3	-

23CB403 ENGINEERING SECURE SOFTWARE SYSTEMS

L	T	P	C
3	0	0	3

COURSE OBJECTIVES:

- To help students know the importance and need for software security.
- To help students know about various attacks.
- To make students learn about secure software design.
- To familiarize with the risk management in secure software development.
- To understand the working of tools related to software security.

UNIT I NEED OF SOFTWARE SECURITY 9

Software assurance and Software security – Threats to software security – Sources of software insecurity – Benefits of detecting software security – Properties of secure software – Influencing the security properties of software.

UNIT II SECURE SOFTWARE DESIGN AND ARCHITECTURE 10

Requirements engineering for secure software – SQUARE process model – Requirements elicitation and prioritization – Security architecture - Software security practices for Architecture and Design: Architectural Risk Analysis – Software security knowledge for Architecture and Design: Security Principles, Security Guidelines, and Attack Patterns.

UNIT III SECURITY RISK MANAGEMENT 8

Risk management life cycle – Risk profiling – Risk exposure factors – Risk evaluation and mitigation – Risk assessment techniques – Threat and vulnerability management – Security risk reviews.

UNIT IV SECURE CODING AND TESTING 9

Code analysis – Coding practices – Software security testing – Security testing considerations throughout the SDLC – Security failures – Examples of functional and attacker perspectives for security analysis – System complexity drivers and security – Deep technical problem complexity – Security controls and services.

UNIT V SECURE PROJECT MANAGEMENT 9

Governance and security – Adopting an enterprise software security framework – Security and project management – Maturity of practice.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

At the end of the course the students will be able to

CO1: Identify the need for software security.

CO2: Apply security principles in software development.

CO3: Evaluate the extent of risks in software systems.

CO4: Demonstrate the knowledge on the concepts of secure coding and security testing.

CO5: Explore the various aspects of security analysis and services.

CO6: Examine the procedure of adopting secure project management.

TEXT BOOKS:

1. Julia H. Allen, Sean Barnum, Robert J. Ellison, Gary McGraw, Nancy R. Mead, "Software Security Engineering", Addison-Wesley, 1st Edition, United States, 2008 (**Unit – 1, 2, 4 & 5**).
2. Evan Wheeler, "Security Risk Management: Building an Information Security Risk Management Program from the Ground Up", Syngress, Illustrated Edition, United States, 2011 (**Unit – 3**).

REFERENCE BOOKS:

1. Chris Wysopal, Lucas Nelson, Dino Dai Zovi, Elfriede Dustin, "The Art of Software Security Testing: Identifying Software Security Flaws", Addison-Wesley Professional, 1st Edition, India, 2006.
2. Jason Grembi, "Developing Secure Software", Cengage Learning, 1st Edition, India, 2009.
3. Lee Allen, "Advanced Penetration Testing for Highly-Secured Environments: The Ultimate Security Guide (Open Source: Community Experience Distilled)", Packt Publishing, Kindle Edition, India, 2012.
4. Bryan Sullivan, Vincent Liu, "Web Application Security, A Beginner's Guide", Osborne / McGraw Hill, 1st Edition, United States, 2012.

COs	POs												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	2	3	2	3	2	-	-	-	2	1	2	2	2	2	-
2	2	2	2	3	3	-	-	-	2	1	2	2	1	2	-
3	1	2	2	2	1	-	-	-	1	1	2	1	2	2	-
4	2	3	2	2	2	-	-	-	2	1	2	2	2	2	-
5	2	3	2	2	2	-	-	-	2	1	2	2	2	2	-
6	2	1	2	2	3	-	-	-	2	1	1	2	2	1	-
Overall correlation	3	2	1	1	3	-	-	-	3	-	-	2	3	3	-

23CS611 INTERNET PROGRAMMING

L	T	P	C
3	0	2	4

COURSE OBJECTIVES:

- To understand different Internet Technologies.
- To learn java-specific web services architecture
- To construct a basic website using HTML and Cascading Style Sheets.
- To build dynamic web page with validation using Java Script objects and by applying different event handling mechanisms.
- To develop server side programs using Servlets and JSP.

UNIT I WEBSITE BASICS, HTML 5, CSS 3, WEB 2.0 — 9

Web Essentials: Clients, Servers and Communication – The Internet – Basic Internet protocols – World wide web – HTTP Request Message – HTTP Response Message – Web Clients – Web Servers – HTML5 – Tables – Lists – Image – HTML5 control elements – Semantic elements – Drag and Drop – Audio – Video controls – CSS3 – Inline, embedded and external style sheets – Rule cascading – Inheritance – Backgrounds – Border Images – Colors – Shadows – Text – Transformations – Transitions – Animations.

UNIT II CLIENT SIDE PROGRAMMING — 9

Java Script: An introduction to JavaScript–JavaScript DOM Model-Date and Objects,-Regular Expressions- Exception Handling-Validation-Built-in objects-Event Handling-DHTML with JavaScript- JSON introduction – Syntax – Function Files – Http Request – SQL.

UNIT III SERVER SIDE PROGRAMMING — 9

Servlets: Java Servlet Architecture- Servlet Life Cycle- Form GET and POST actions-Session Handling- Understanding Cookies- Installing and Configuring Apache Tomcat Web Server- DATABASE CONNECTIVITY: JDBC perspectives, JDBC program example – JSP: Understanding Java Server Pages-JSP Standard Tag Library (JSTL)-Creating HTML forms by embedding JSP code.

UNIT IV PHP and XML — 9

An introduction to PHP: PHP- Using PHP- Variables- Program control- Built-in functions-Form Validation- Regular Expressions – File handling – Cookies – Connecting to Database. XML: Basic XML- Document Type Definition- XML Schema DOM and Presenting XML, XML Parsers and Validation, XSL and XSLT Transformation, News Feed (RSS and ATOM).

UNIT V INTRODUCTION TO AJAX and WEB SERVICES — 9

AJAX: Ajax Client Server Architecture-XML Http Request Object-Call Back Methods; Web Services: Introduction- Java web services Basics – Creating, Publishing, Testing and Describing a Web services (WSDL)-Consuming a web service, Database Driven web service from an application –SOAP.

TOTAL: 45 PERIODS

PRACTICAL EXERCISES: 30 PERIODS

1. Create a web page with the following using HTML (A) to embed a map in a web page (B) To fix the hot spots in that map (C) Show all the related Information when the hot spots are clicked.
2. Create a web page with the following. a. Cascading style sheets. b. Embedded style sheets. c. Inline style sheets. Use our college information for the web pages.
3. Validate the Registration, user login, user profile and payment by credit card pages using JavaScript.
4. Write programs in Java using Servlets: (A) To invoke servlets from HTML forms (B) Session tracking using hidden form fields and Session tracking for a hit count.
5. Write programs in Java to create three-tier applications using servlets for conducting online examination for displaying student mark list. Assume that student information is available in a database which has been stored in a database server.
6. Install TOMCAT web server. Convert the static web pages of programs into dynamic web pages using servlets (or JSP) and cookies. Hint: Users information (user id, password, credit card number) would be stored in web.xml. Each user should have a separate Shopping Cart.
7. Redo the previous task using JSP by converting the static web pages into dynamic web pages. Create a database with user information and books information. The books catalogue should be dynamically loaded from the database.
8. Create and save an XML document at the server, which contains 10 users Information. Write a Program, which takes user Id as an input and returns the User details by taking the user information from the XML document.
9. Validate the form using PHP regular expression. ii. PHP stores a form data into database.
10. Write a web service for finding what people think by asking 500 people's opinion for any consumer product.

COURSE OUTCOMES:

At the end of the course the students will be able to

CO1: Construct a basic website using HTML and Cascading Style Sheets.
CO2: Explain java-specific web services architecture
CO3: Build dynamic web page with validation using Java Script objects and by applying different event handling mechanisms.
CO4: Develop server side programs using Servlets and JSP.
CO5: Construct simple web pages in PHP and to represent data in XML format.
CO6: Use AJAX and web services to develop interactive web applications

TEXT BOOK:

Deitel and Deitel and Nieto, "Internet and World Wide Web - How to Program", Prentice Hall, 5th Edition, 2011.

REFERENCE BOOKS:

1. Stephen Wynkoop and John Burke "Running a Perfect Website", QUE, 2nd Edition,1999.
2. Chris Bates, "Web Programming – Building Intranet Applications", 3rd Edition, Wiley Publications, 2009.
3. Jeffrey C and Jackson, "Web Technologies A Computer Science Perspective", Pearson Education, 2011.
4. Gopalan N.P. and Akilandeswari J., "Web Technology", Prentice Hall of India, 2011.
5. UttamK.Roy, "Web Technologies", Oxford University Press, 2011

COs	**POs**												**PSOs**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
1	3	3	3	3	3	-	-	-	3	1	3	2	2	3	-
2	3	3	3	3	3	-	-	-	1	2	3	3	2	1	-
3	3	3	2	2	3	-	-	-	1	1	1	3	2	3	-
4	3	3	3	3	3	-	-	-	1	1	3	2	3	1	-
5	3	2	2	2	3	-	-	-	2	2	3	1	3	1	-
6	3	3	3	3	3	-	-	-	1	2	2	1	1	2	-
Overall correlation	3	3	3	2	3	-	-	-	2	1	3	2	2	2	-

23CB421 OPERATING SYSTEMS AND SECURITY LABORATORY

L	T	P	C
0	0	4	2

COURSE OBJECTIVES:

- To understand the basics of UNIX command and shell programming.
- To implement various CPU scheduling algorithms.
- To implement Deadlock Avoidance and Deadlock Detection Algorithms
- To implement Page Replacement Algorithms
- To implement various memory allocation methods.
- To apply various access control mechanism.
- To evaluate vulnerability in computer systems..

LIST OF EXPERIMENTS :

1. Illustration of UNIX commands and Shell Programming.
2. Implementation of various CPU scheduling algorithms using C program.
3. Illustrate the inter process communication strategy.
4. Implementation of mutual exclusion by semaphore.
5. Implement dead lock avoidance and detection using C program.
6. C programs to implement threading.
7. Implementation of paging technique using C program.
8. C programs to implement the memory allocation methods.
9. C programs to implement the various page replacement algorithms.
10. C programs for the implementation of various access control mechanism.
11. Demonstrate SQL injection attack and its counter measures.
12. Implementation of Malware detection.

TOTAL : 45 PERIODS

COURSE OUTCOMES:

At the end of the course the students will be able to

CO1: Implement Shell commands

CO2: Implement Deadlock avoidance, Detection Algorithms.

CO3: Implement CPU Scheduling Algorithm and Page replacement algorithms.

CO4: Implement Inter-Process Communication and mutual exclusion by Semaphore.

CO5: Implement access control techniques.

CO6: Implement and demonstrate SQL injection and Malware detection.

COs	POs												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	3	3	3	3	3	2	1	1	2	2	-	1	3	3	-
2	3	3	3	3	3	2	1	1	2	2	-	1	3	3	-
3	3	3	3	3	3	2	1	1	2	2	-	1	3	3	-
4	3	3	3	3	3	2	1	1	2	2	-	1	3	3	-
5	3	3	3	3	3	2	1	1	2	2	-	1	3	3	-
6	3	3	3	3	3	2	1	1	2	2	-	1	3	3	-
Overall correlation	3	3	3	3	3	3	2	2	3	3	-	1	3	3	-

23CS422 ARTIFICIAL INTELLIGENCE LABORATORY

L	T	P	C
0	0	4	2

COURSE OBJECTIVES:

- To design and implement different techniques to develop simple autonomous agentsthat make effective decisions in fully informed, and partially observable, settings.
- To apply appropriate algorithms for solving given AI problems.To Design and implement logical reasoning agents.
- To Design and implement agents that can reason under uncertainty.
- To understand the Implementation of these reasoning systems using either backwardor forward inference mechanisms

LIST OF EXPERIMENTS :

1. Construct descriptions of agent behavior for various AI tasks
2. Implement basic search strategies for selected AI applications
3. Implement A* and memory bounded A* algorithms
4. Implement genetic algorithms for AI tasks
5. Implement simulated annealing algorithms for AI tasks
6. Implement alpha-beta tree search
7. Implement backtracking algorithms for CSP
8. Implement local search algorithms for CSP
9. Implement propositional logic inferences for AI tasks
10. Implement resolution based first order logic inferences for AI tasks
11. Implement classical planning algorithms

TOTAL : 45 PERIODS

COURSE OUTCOMES:

At the end of the course the students will be able to

CO1: Implement simple PEAS descriptions for given AI tasks.

CO2: Develop programs to implement simulated annealing and genetic algorithms.

CO3: Demonstrate the ability to solve problems using searching and backtracking.

CO4: Ability to implement simple reasoning systems using either backward or forward inference mechanisms.

CO5: choose and implement a suitable technics for a given AI task choose and implement a suitable technics for a given AI task.

CO6: Design applications for NLP that use Artificial Intelligence.

COs	POs												PSCOs		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
1	3	1	1	3	1	1	1	1	3	3	2	1	3	3	1
2	2	3	1	3	2	1	1	1	1	2	2	2	1	2	1
3	1	3	3	2	2	1	1	1	2	3	1	2	1	3	1
4	1	2	3	3	1	1	1	1	3	2	1	3	3	3	1
5	1	2	3	2	1	2	2	2	2	1	1	1	3	2	1
6	1	2	3	2	1	1	1	1	2	1	1	1	3	2	1
Overall correlation	2	2	2	2	1	2	2	2	2	1	1	1	1	2	2

23ES491	APTITUDE AND LOGICAL REASONING –I	L	T	P	C
		0	0	2	1

COURSE OBJECTIVES:

- To improve the problem solving and logical thinking ability of the students.
- To acquaint student with frequently asked questions and patterns in quantitative aptitude and logical reasoning.

UNIT I **4**

Numbers, LCM, HCF, Averages, Ratio & Proportion, Mixtures & Allegation.

UNIT II **4**

Percentages, Time and work, Pipes and Cistern, coding and decoding

UNIT III **4**

Time Speed Distance, Train, Boats and Streams, Analogy

UNIT IV **4**

Data Interpretation(BAR,PIE,LINE), Seating arrangement

UNIT V **4**

Simple Interest and Compound Interest, Profit loss and Discount, Partnership,

TOTAL: 20 PERIODS

COURSE OUTCOMES:

At the end of the course the students will be able to

CO 1 Understand the basic concepts of quantitative ability

CO 2 Understand the basic concepts of logical reasoning Skills

CO 3 Increase in critical thinking skills

CO 4 Able to solve campus placements aptitude papers covering Quantitative Ability, Logical Reasoning Ability

TEXT BOOK:

APTIPEDIA, 2nd edition, Wiley Publishers

REFERENCE BOOKS:

1. Quantitative Aptitude – R.S. Agarwal
2. A Modern Approach To Verbal & Non-Verbal Reasoning By R S Agarwal

KCG COLLEGE OF TECHNOLOGY (AUTONOMOUS)
REGULATIONS 2023
B.E. CIVIL ENGINEERING
CHOICE BASED CREDIT SYSTEM
CURRICULUM FOR SEMESTERS I TO VIII

SEMESTER – I

SL. NO	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
	23IP101	Induction Programme		-	-	-	-	-
THEORY								
1	23HS101	Essential Communication	HSMC	3	0	0	3	3
2	23MA101	Matrices and Calculus	BSC	3	0	0	3	3
3	23AD101	Programming in Python	ESC	3	0	0	3	3
4	23HS102	Heritage of Tamils	HSMC	1	0	0	1	1
THEORY AND PRACTICALS								
5	23PH111	Engineering Physics	BSC	3	0	2	5	4
6	23CY111	Engineering Chemistry	BSC	3	0	2	5	4
PRACTICALS								
7	23AD121	Python Programming Laboratory	ESC	0	0	4	4	2
8	23HS121	Communication Skills Laboratory	HSMC	0	0	2	2	1
9	23HS122	General Clubs / Technical Clubs / NCC / NSS / Extension Activities	HSMC	0	0	2	2	1*
TOTAL				**16**	**0**	**12**	**28**	**21**

*The grades earned by the students will be recorded in the Mark Sheet, however the same shall not be considered for the computation of CGPA

SEMESTER – II

SL. NO	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
THEORY								
1	23HS201	Professional English / Foreign Language	HSMC	3	0	0	3	3
2	23MA203	Statistics and Numerical Methods	BSC	3	1	0	4	4
3	23PH201	Physics for Civil Engineering	BSC	3	0	0	3	3
4	23CE201	Building Materials	PCC	3	0	0	3	3
5	23HS203	Tamils and Technology	HSMC	1	0	0	1	1
THEORY AND PRACTICALS								
6	23EE282	Basic Electrical, Electronics and Instrumentation Engineering	ESC	2	0	2	4	3
7	23ME211	Engineering Graphics	ESC	3	0	2	5	4
PRACTICALS								
8	23ME221	Engineering Practices Laboratory	ESC	0	0	4	4	2
9	23CE221	Materials Testing Laboratory	PCC	0	0	4	4	2
10	23HS221	Soft Skills	EEC	0	0	2	2	1*
TOTAL				**18**	**1**	**14**	**33**	**25**

SEMESTER III

SL. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
THEORY								
1	23MA302	Transforms and Partial Differential Equations	BSC	3	1	0	4	4
2	23CE301	Engineering Mechanics	PCC	3	0	0	3	3
3	23HS301	Universal Human Values and Ethics	HSMC	3	0	0	3	3
THEORY AND PRACTICALS								
4	23CE311	Surveying	PCC	3	0	2	5	4
5	23CE312	Advanced Concrete Technology	PCC	3	0	2	5	4
6	23ME312	Fluid Mechanics and Hydraulic Machinery	PCC	3	0	2	5	4
PRACTICALS								
7	23CE321	Computer Aided Building Drawing Laboratory	PCC	0	0	4	4	2
8	23ES391	Presentation Skills	EEC	0	0	2	2	1*
TOTAL				**18**	**1**	**12**	**31**	**24**

SEMESTER IV

SL. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
THEORY								
1	23MA402	Optimization Techniques	BSC	3	1	0	4	4
2	23CE401	Transportation Engineering	PCC	3	0	0	3	3
3	23CE402	Water supply and Waste Water Engineering	PCC	3	0	0	3	3
4		Department Elective 1	DEC	3	0	0	3	3
THEORY AND PRACTICALS								
5	23CE411	Soil Mechanics	PCC	3	0	2	5	4
6	23CE412	Strength of Materials	PCC	3	0	2	5	4
PRACTICALS								
7	23CE421	Water and Waste water Analysis Laboratory	PCC	0	0	4	4	2
8	23ES491	Aptitude and Logical Reasoning -1	EEC	0	0	2	2	*1
9	23CE422	In plant training	EEC	0	0	2	2	1
TOTAL				**18**	**1**	**12**	**31**	**24**

SEMESTER V

SL. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK L	T	P	TOTAL CONTACT PERIODS	CREDITS
THEORY								
1	23RE501	Research Methodology and Intellectual Property Rights	ESC	2	0	0	2	2
2	23CE501	Design of Reinforced Concrete Elements	PCC	3	0	0	3	3
3	23CE502	Structural Analysis I	PCC	3	0	0	3	3
4	23CE503	Foundation Engineering	PCC	3	0	0	3	3
5		Department Elective 2	DEC	3	0	0	3	3
6		Non - Department Elective 1 (Emerging Technology)	NEC	3	0	0	3	3
PRACTICALS								
7	23CE521	Computer Aided Design and Detailing Laboratory	PCC	0	0	4	4	2
8	23CE522	Survey Camp	PCC	0	0	4	4	2
9	23CE523	Mini Project	EEC	0	0	4	4	2
10	23ES591	Aptitude and Logical Reasoning - 2	EEC	0	0	2	2	*1
TOTAL				**17**	**0**	**14**	**31**	**23**

SEMESTER VI

SL. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK L	T	P	TOTAL CONTACT PERIODS	CREDITS
THEORY								
1	23CE601	Design of Steel Structures	PCC	3	0	0	3	3
2	23CE602	Structural Analysis II	PCC	3	0	0	3	3
3		Department Elective 3	DEC	3	0	0	3	3
4		Department Elective 4	DEC	3	0	0	3	3
5		Non - Department Elective 2 (Management /Safety Courses)	NEC	3	0	0	3	3
THEORY AND PRACTICALS								
6	23CE611	Environmental Sciences and Engineering	ESC	3	0	2	5	4
PRACTICALS								
7	23CE621	Project Work - Phase 1	EEC	0	0	4	4	2
8	23CE622	Technical Training	EEC	0	0	2	2	1
9	23CE623	Technical Seminar - 1	ESC	0	0	2	2	1
TOTAL				**18**	**0**	**10**	**28**	**23**

SEMESTER VII

SL. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
THEORY								
1		Non - Department Elective 3 (Management Courses)	NEC	3	0	0	3	3
2		Department Elective 5	DEC	3	0	0	3	3
3		Department Elective 6	DEC	3	0	0	3	3
4	23CE701	Comprehension	EEC	2	0	0	2	2
THEORY AND PRACTICALS								
5	23CE711	Estimation Costing and Valuation Engineering	PCC	3	0	2	5	4
PRACTICALS								
6	23CE721	Project Work - Phase 2	EEC	0	0	6	6	3
7	23CE722	Technical Seminar - 2	ESC	0	0	4	4	2
TOTAL				**14**	**0**	**12**	**26**	**20**

SEMESTER VIII

SL. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
PRACTICALS								
1	23CE821/ 23CE822	Internship/ Capstone Project	EEC	0	0	20	20	10
TOTAL				**0**	**0**	**20**	**20**	**10**

TOTAL CREDITS: 170

DEPARTMENT ELECTIVE COURSES: VERTICALS

VERTICAL 1: STRUCTURES

SL. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1	23CE031	Repair and Rehabilitation of Structures	DEC	3	0	0	3	3
2	23CE032	Dynamics and Earthquake Resistant Structures	DEC	3	0	0	3	3
3	23CE033	Prestressed Structures	DEC	3	0	0	3	3
4	23CE034	Prefabricated Structures	DEC	3	0	0	3	3
5	23CE035	Composite Structures	DEC	3	0	0	3	3
6	23CE036	Finite Element Method	DEC	3	0	0	3	3

VERTICAL 2: GEOTECHNICAL

SL. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1	23CE037	Geo environmental Engineering	DEC	3	0	0	3	3
2	23CE038	Ground Improvement Techniques	DEC	3	0	0	3	3
3	23CE039	Pile Foundation	DEC	3	0	0	3	3
4	23CE040	Tunneling Engineering	DEC	3	0	0	3	3
5	23CE041	Earth Retaining Structures	DEC	3	0	0	3	3
6	23CE042	Soil Dynamics and Machine Foundations	DEC	3	0	0	3	3

VERTICAL 3: TRANSPORTATION & INFRASTRUCTURES

SL. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1	23CE043	Intelligent Transport Systems	DEC	3	0	0	3	3
2	23CE044	Urban Planning and Development	DEC	3	0	0	3	3
3	23CE045	Transportation Planning Process	DEC	3	0	0	3	3
4	23CE046	Smart Cities	DEC	3	0	0	3	3
5	23CE047	Pavement Engineering	DEC	3	0	0	3	3
6	23CE048	Traffic Engineering and Management	DEC	3	0	0	3	3

VERTICAL 4: WATER RESOURCES

SL. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1	23CE049	Water Quality and Management	DEC	3	0	0	3	3
2	23CE050	Ground Water Engineering	DEC	3	0	0	3	3
3	23CE051	Watershed Conservation and Management	DEC	3	0	0	3	3
4	23CE052	Integrated Water Resources Management	DEC	3	0	0	3	3
5	23CE053	Hydrology and Irrigation Engineering	DEC	3	0	0	3	3
6	23CE054	Water Resources system Engineering	DEC	3	0	0	3	3

VERTICAL 5: GEO INFORMATICS

SL. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1	23CE055	Airborne and Terrestrial Laser Mapping	DEC	3	0	0	3	3
2	23CE056	Remote Sensing Concepts	DEC	3	0	0	3	3
3	23CE057	Satellite Image Processing	DEC	3	0	0	3	3
4	23CE058	Cartography and GIS	DEC	3	0	0	3	3
5	23CE059	Photogrammetry	DEC	3	0	0	3	3
6	23CE060	Hydrographic Surveying	DEC	3	0	0	3	3

VERTICAL 6: CONSTRUCTION TECHNIQUES

SL. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1	23CE061	Formwork Engineering	DEC	3	0	0	3	3
2	23CE062	Sustainable Construction and Lean Construction	DEC	3	0	0	3	3
3	23CE063	Construction Planning and Scheduling	DEC	3	0	0	3	3
4	23CE064	Construction Techniques Equipment & Practices	DEC	3	0	0	3	3
5	23CE065	Energy Efficient Buildings	DEC	3	0	0	3	3
6	23CE066	Rainwater Harvesting	DEC	3	0	0	3	3

VERTICAL 7: ENVIRONMENT

SL. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1	23CE067	Climate Change Adaptation and Mitigation	DEC	3	0	0	3	3
2	23CE068	Air and Noise Pollution Control Engineering	DEC	3	0	0	3	3
3	23CE069	Environmental Impact Assessment	DEC	3	0	0	3	3
4	23CE070	Solid and Hazardous Waste Management	DEC	3	0	0	3	3
5	23CE071	Environmental Health and Safety	DEC	3	0	0	3	3
6	23CE072	Environmental Quality Monitoring	DEC	3	0	0	3	3

VERTICAL 8: OCEAN ENGINEERING

SL. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1	23CE073	Ocean Wave Dynamics	DEC	3	0	0	3	3
2	23CE074	Marine Geotechnical Engineering	DEC	3	0	0	3	3
3	23CE075	Coastal Engineering	DEC	3	0	0	3	3
4	23CE076	Port and Harbour Engineering	DEC	3	0	0	3	3
5	23CE077	Coastal Hazards and Mitigation	DEC	3	0	0	3	3
6	23CE078	Offshore Structures	DEC	3	0	0	3	3

NON-DEPARMENT ELECTIVE

EMERGING TECHNOLOGY

SL NO	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1	23NE975	IoT concepts and applications	NEC	3	0	0	3	3
2	23NE980	Renewable Energy Systems	NEC	3	0	0	3	3
3	23NE985	Introduction to Non-destructive Testing	NEC	3	0	0	3	3

MANAGEMENT COURSES

SL NO	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1	23HS971	Total Quality Management	NEC	3	0	0	3	3
2	23HS972	Engineering Economics and Financial Accounting	NEC	3	0	0	3	3
3	23HS973	Engineering Management and Law	NEC	3	0	0	3	3
4	23HS974	Knowledge Management	NEC	3	0	0	3	3
5	23HS975	Industrial Management	NEC	3	0	0	3	3
6	23HS976	Entrepreneurship and Business Opportunities	NEC	3	0	0	3	3
7	23HS977	Modern Business Administration and Financing	NEC	3	0	0	3	3
8	23HS978	Essentials of Management	NEC	3	0	0	3	3

SAFETY COURSES

SL NO	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1	23HS979	Disaster Management	NEC	3	0	0	3	3
2	23HS980	Industrial Safety	NEC	3	0	0	3	3
3	23HS981	Automotive Safety	NEC	3	0	0	3	3

SEMESTER-WISE CREDIT DISTRIBUTION

SEMESTER	HSMC	BSC	ESC	PCC	DEC	NEC	EEC	Total
Semester I	5	11	5					**21**
Semester II	4	7	9	5				**25**
Semester III	3	4		17				**24**
Semester IV		4		16	3		1	**24**
Semester V			2	13	3	3	2	**23**
Semester VI			5	6	6	3	3	**23**
Semester VII			2	4	6	3	5	**20**
Semester VIII							10	**10**
KCG - Civil	**12**	**26**	**23**	**61**	**18**	**9**	**21**	**170**

23MA302	TRANSFORMS AND PARTIAL DIFFERENTIAL EQUATIONS	L	T	P	C
		3	1	0	4

COURSE OBJECTIVES:

- To introduce the basic concepts of PDE for solving standard partial differential equations.
- To introduce Fourier series analysis which is central to many applications in engineering apart from its use in solving boundary value problems.
- To acquaint the student with Fourier series techniques in solving heat flow problems used in various situations.
- To acquaint the student with Fourier transform techniques used in wide variety of situations.
- To introduce the effective mathematical tools for the solutions of partial differential equations that model several physical processes and to develop Z transform techniques for discrete time systems.

UNIT I PARTIAL DIFFERENTIAL EQUATIONS 9+3

Formation of partial differential equations –Solutions of standard types of first order partial differential equations - Lagrange's linear equation - Linear partial differential equations of second and higher order with constant coefficients of both homogeneous and non-homogeneous types.

UNIT II FOURIER SERIES 9+3

Dirichlet's conditions – General Fourier series – Odd and even functions – Half range sine series and cosine series – Root mean square value – Parseval's identity – Harmonic analysis.

UNIT III APPLICATIONS OF PARTIAL DIFFERENTIAL EQUATIONS 9+3

Classification of second order Quasi Linear PDE – Method of separation of variables - Fourier series solutions of one dimensional wave equation – One dimensional equation of Heat conduction – Steady state solution of two dimensional equation of heat conduction (Infinite) (Cartesian coordinates only).

UNIT IV FOURIER TRANSFORMS 9+3

Statement of Fourier integral theorem– Fourier transform pair – Fourier sine and cosine transforms – Properties – Transforms of simple functions – Convolution theorem (Without proof) – Parseval's identity.

UNIT V Z-TRANSFORMS AND DIFFERENCE EQUATIONS 9+3

Z-transforms - Elementary properties – Convergence of Z-transforms – Initial and final value theorems - Inverse Z-transform using partial fraction and convolution theorem - Formation of difference equations – Solution of difference equations using Z - transforms.

TOTAL: 60 PERIODS

COURSE OUTCOMES:

At the end of the course the students will be able to

CO 1 Understand how to solve the given standard partial differential equations.

CO 2 Understand Fourier series analysis which plays a vital role in engineering applications.

CO 3 Examine the physical significance of Fourier series techniques in solving one and two dimensional heat flow problems and one dimensional wave equations.

CO 4 Understand the mathematical principles on Fourier transforms to solve some of the physical problems of engineering.

CO 5 Understand Z transforms , inverse Z transforms and its elementary properties

CO 6 Apply the effective mathematical tools for the solutions of difference equations by using Z transform techniques for discrete time systems.

TEXT BOOKS:

1. Kreyszig.E, "Advanced Engineering Mathematics", John Wiley and Sons, 10th Edition, New Delhi, 2016.
2. Grewal.B.S., “Higher Engineering Mathematics”, Khanna Publishers, New Delhi, 44th Edition, 2018.
3. P.Sivaramakrishna Das and C.Vijayakumari “A Text Book on TPDE” Pearson Publications.

REFERENCE BOOKS:

1. Narayanan. S., Manicavachagom Pillay.T.K and Ramanaiah.G "Advanced Mathematics for Engineering Students", Vol. II & III, S.Viswanathan Publishers Pvt. Ltd, Chennai, 1998.
2. Ramana. B.V., "Higher Engineering Mathematics", McGraw Hill Education Pvt. Ltd, New Delhi, 2018.

COs	**POs**												**PSOs**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
1	3	3	3	-	-	-	-	-	-	-	-	2	2	-	1
2	3	3	3	-	-	-	-	-	-	-	-	2	2	-	1
3	2	2	2	-	-	-	-	-	-	-	-	2	2	-	1
4	3	3	3	-	-	-	-	-	-	-	-	2	2	-	1
5	2	2	2	-	-	-	-	-	-	-	-	2	2	-	1
6	2	2	2	-	-	-	-	-	-	-	-	2	2	-	1
Overall correlation	3	3	2	-	-	-	-	-	-	-	-	2	2	-	1

23CE301	ENGINEERING MECHANICS	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To learn the use scalar and vector analytical techniques for analyzing forces.
- To introduce the equilibrium of rigid bodies.
- To study the properties of surfaces & solids.
- To determine the application of the concepts of frictional forces at the contact surfaces of various engineering systems.
- To develop basic dynamics concepts – force, momentum, work and energy.

UNIT I STATICS OF PRINCIPLES 9

Fundamental Concepts and Principles, Systems of Units, Method of Problem Solutions, Statics of Particles -Forces in a Plane, Resultant of Forces, Resolution of a Force into Components, Rectangular Components of a Force, Unit Vectors. Equilibrium of a Particle- Newton's First Law of Motion, Space and Free-Body Diagrams, Forces in Space, Equilibrium of a Particle in Space.

UNIT II EQUILIBRIUM OF RIGID BODIES 9

Principle of transmissibility - Varignon's theorem -Types of supports - Action and reaction forces - stable equilibrium - Moment of a force about a point and about an axis – Single equivalent force - Equilibrium of rigid bodies in two dimensions - Equilibrium of rigid bodies in three dimensions, Analysis of Trusses – Method of Joints and Method of sections.

UNIT III PROPERTIES OF SURFACES AND SOLIDS 9

Centroids and centre of mass - Centroids of lines and areas - Rectangular, circular, triangular areas by integration - T section, I section, Angle section, Hollow section by using standard formula - Theorems of Pappus - Area moments of inertia of plane areas - rectangular, circular, triangular areas by integration - T section, I section, Angle section, Hollow section by using standard formula - Parallel axis theorem and Perpendicular axis theorem - Principal moments of inertia of plane areas - Principal axes of inertia-Mass moment of inertia - mass moment of inertia for prismatic, cylindrical and spherical solids from first principle – Relation to area moments of inertia.

UNIT IV FRICTION 10

The Laws of Dry Friction, Coefficients of Friction, Angles of Friction, Wedge friction, Wheel Friction, Rolling Resistance, Ladder friction.

UNIT V DYNAMICS OF PARTICLES 8

Kinematics - Rectilinear Motion and Curvilinear Motion of Particles. Kinetics- Newton's Second Law of Motion -Equations of Motions, Dynamic Equilibrium, Energy and Momentum Methods - Work of a Force, Kinetic Energy of a Particle, Principle of Work and Energy, Principle of Impulse and Momentum, Impact of bodies.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

At the end of the course the

CO1: Illustrate the vectorial and scalar representation of forces and moments.

CO2: Analyse the rigid body in equilibrium.

CO3: Evaluate the properties of distributed forces in surfaces.

CO4: Examine the properties of distributed forces in solids.

CO5: Compute the friction and the effects by the laws of friction.

CO6: Calculate dynamic forces exerted in rigid body.

TEXT BOOKS:

1. Beer Ferdinand P, Russel Johnston Jr., David F Mazurek, Philip J Cornwell, Sanjeev Sanghi, "Vector Mechanics for Engineers: Statics and Dynamics", McGraw Higher Education, 11thEdition, 2017.
2. Vela Murali, "Engineering Mechanics-Statics and Dynamics", Oxford University Press, 2018.

REFERENCE BOOKS:

1. Bhavikatti, S.S and Rajashekarappa, K.G., "Engineering Mechanics", New Age International (P) Limited Publishers, 1998.
2. Rajasekaran S and Sankarasubramanian G., "Engineering Mechanics Statics and Dynamics", 3rd Edition, Vikas Publishing House Pvt. Ltd., 2005.
3. Irving H. Shames, Krishna Mohana Rao G, "Engineering Mechanics – Statics and Dynamics", 4thEdition, Pearson Education Asia Pvt. Ltd., 2005.
4. Timoshenko S, Young D H, Rao J V and Sukumar Pati, "Engineering Mechanics", 5thEdition, McGraw Hill Higher Education, 2013.

COs	**POs**												**PSOs**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
1	3	2	2	1	2	-	-	-	-	-	-	2	3	-	-
2	3	2	2	1	2	-	-	-	-	-	-	2	3	-	-
3	3	2	3	1	2	-	-	-	-	-	-	2	3	-	-
4	3	2	3	1	2	-	-	-	-	-	-	2	3	-	-
5	3	2	3	1	2	-	-	-	-	-	-	2	3	-	-
Overall correlation	3	2	3	1	2	-	-	-	-	-	-	2	3	-	-

23HS301	UNIVERSAL HUMAN VALUES AND ETHICS	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- Development of a holistic perspective based on self-exploration about themselves (human being), family, society and nature/existence.
- Understanding (or developing clarity) of the harmony in the human being, family, society and nature/existence.
- Strengthening of self-reflection.
- Development of commitment and courage to act.

UNIT I COURSE INTRODUCTION 9

Need, Basic Guidelines, Content and Process for Value Education - Understanding the need, basic guidelines, content and process for Value Education -Self Exploration–what is it? - its content and process; 'Natural Acceptance' and Experiential Validation- as the mechanism for self-exploration - Continuous Happiness and Prosperity- A look at basic Human Aspirations -Right understanding, Relationship and Physical Facilities- the basic requirements for fulfilment of aspirations of every human being with their correct priority -Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario -Method to fulfil the above human aspirations: understanding and living in harmony at various levels.

UNIT II UNDERSTANDING HARMONY IN THE HUMAN BEING 9

Harmony in Myself- Understanding human being as a co-existence of the sentient 'I' and the material 'Body' -Understanding the needs of Self ('I') and 'Body' - Sukh and Suvidha-Understanding the Body as an instrument of 'I' (I being the doer, seer and enjoyer) - Understanding the characteristics and activities of 'I' and harmony in 'I' -Understanding the harmony of I with the Body: Sanyam and Swasthya; correct appraisal of Physical needs, meaning of Prosperity.

UNIT III UNDERSTANDING HARMONY IN THE FAMILY AND SOCIETY 9

Harmony in Human-Human Relationship -Understanding Harmony in the family – the basic unit of human interaction -Understanding values in human-human relationship; meaning of Nyaya and program for its fulfilment to ensure satisfaction; Trust(Vishwas) and Respect as the foundational values of relationship -Understanding the meaning of Vishwas; Difference between intention and competence -Understanding the meaning of Samman, Difference between respect and differentiation; the other salient values in relationship -Understanding the harmony in the society (society being an extension of family)-Visualizing a universal harmonious order in society- Undivided Society (Akhand Samaj), Universal Order- from family to world family.

UNIT IV ENGINEERING ETHICS **9**

Senses of ‗Engineering Ethics„ – Variety of moral issues – Types of inquiry – Moral dilemmas – Moral Autonomy – Kohlberg's theory – Gilligan's theory – Consensus and Controversy – Models of professional roles - Theories about right action – Self-interest – Customs and Religion – Uses of Ethical Theories.

UNIT V SAFETY, RESPONSIBILITY AND RIGHTS **9**

Safety and Risk – Assessment of Safety and Risk – Risk Benefit Analysis and Reducing Risk - Respect for Authority – Collective Bargaining – Confidentiality – Conflicts of Interest – Occupational Crime – Professional Rights – Employee Rights – Intellectual Property Rights (IPR) – Discrimination-Moral Leadership –Code of Conduct – Corporate Social Responsibility.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

At the end of the course the students will be able to

CO1: Understand the need of value education.

CO2: Comprehend the difference between self and body.

CO3: Understand the need to exist as an unit of Family and society.

CO4: Understand Harmony at all levels.

CO5: Apply the values acquired in the professional front.

CO6: Identify appropriate technologies for ecofriendly production systems.

TEXT BOOKS:

1. Human Values and Professional Ethics by R R Gaur, R Sangal, G P Bagaria, Excel Books, New Delhi, 2010 3.
2. Mike W. Martin and Roland Schinzinger, ―Ethics in Engineering‖, Tata McGraw Hill, New Delhi, 2003.
3. Govindarajan M, Natarajan S, Senthil Kumar V. S, ―Engineering Ethics‖, Prentice Hall of India, New Delhi, 2004

REFERENCE BOOKS:

1. Jeevan Vidya: Ek Parichaya, A Nagaraj, Jeevan Vidya Prakashan, Amarkantak, 1999.
2. Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004.
3. The Story of Stuff (Book).
4. The Story of My Experiments with Truth - by Mohandas Karamchand Gandhi AICTE Model Curriculum in Humanities, Social Science and Management Courses (UG Engineering & Technology) 169 | Page .
5. Small is Beautiful - E. F Schumacher.
6. Slow is Beautiful - Cecile Andrews.
7. Economy of Permanence - J C Kumarappa 8. Bharat Mein Angreji Raj – Pandit Sunderlal.

8. Rediscovering India - by Dharampal.
9. Hind Swaraj or Indian Home Rule - by Mohandas K. Gandhi .
10. India Wins Freedom - Maulana Abdul Kalam Azad.
11. Vivekananda - Romain Rolland (English) 13. Gandhi - Romain Rolland (English).
12. Charles B. Fleddermann, ―Engineering Ethics‖, Pearson Prentice Hall, New Jersey, 2004.
13. Charles E. Harris, Michael S. Pritchard and Michael J. Rabins, ―Engineering Ethics – Concepts and Cases‖, Cengage Learning, 2009.

WEB SOURCES:

1. www.onlineethics.org
2. www.nspe.org
3. www.globalethics.org

COs	POs												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	-	-	-	-	-	3	3	3	3	3	-	-	-	-	3
2	-	-	-	-	-	3	3	3	3	3	-	-	-	-	3
3	-	-	-	-	-	3	3	3	3	3	-	-	-	-	3
4	-	-	-	-	-	3	3	3	3	3	-	-	-	-	3
5	-	-	-	-	-	3	3	3	3	3	-	-	-	-	3
6	-	-	-	-	-	3	3	3	3	3	-	-	-	-	3
Overall correlation	-	-	-	-	-	3	3	3	3	3	-	-	-	-	3

23CE311 SURVEYING

L	T	P	C
3	0	2	4

COURSE OBJECTIVES:

To develop the rudiments of plane surveying and geodetic principles for Civil Engineers.

- To familiarize the students with the various methods of plane and geodetic surveying to solve real-world problems.
- To familiarize the student with the concepts of Control Surveying.
- To make the students understand various techniques of modern surveying

UNIT I FUNDAMENTALS OF CONVENTIONAL SURVEYING 9

Definition – Classifications – Basic principles – Equipment and accessories for ranging and chaining – Methods of ranging – Well-conditioned triangles – Chain traversing – Compass – Basic principles – Types – Bearing – System and conversions – Sources of errors and Local attraction – Magnetic declination – Dip – compass traversing – Plane table and its accessories – Merits and demerits – Radiation – Intersection – Resection – Plane table traversing.

UNIT II LEVELLING 9

Level line – Horizontal line – Datum – Benchmarks – Levels and staves – Temporary and permanent adjustments – Methods of leveling – Fly leveling – Check leveling – Procedure in leveling – Booking – Reduction – Curvature and refraction – Reciprocal leveling – Precise leveling - Contouring.

UNIT III THEODOLITE SURVEYING 9

Horizontal and vertical angle measurements – Temporary and permanent adjustments – Heights and distances – Tacheometric surveying – Stadia Tacheometry – Tangential Tacheometry – Trigonometric leveling – Single Plane method – Double Plane method.

UNIT IV CONTROL SURVEYING AND ADJUSTMENT 9

Horizontal and vertical control – Methods – Triangulation – Traversing – Gale's table – Trilateration – Concepts of measurements and errors – Error propagation and Linearization – Adjustment methods - Least square methods – Angles, lengths and levelling network.

UNIT V MODERN SURVEYING 9+6

Total Station: Digital Theodolite, EDM, Electronic field book – Advantages – Parts and accessories – Working principle – Observables – Errors - COGO functions – Field procedure and applications. GPS: Advantages – System components – Signal structure – Selective availability and anti-spoofing receiver components and antenna – Planning and data acquisition – Data processing – Errors in GPS – Field procedure and applications.

TOTAL: 45 PERIODS

LIST OF EXPERIMENTS

CHAIN SURVEY

1. Study of chains and its accessories, Aligning, Ranging, Chaining and Marking Perpendicular offset.
2. Setting out works – Foundation marking using tapes single Room and Double Room.

COMPASS SURVEY

1. Compass Traversing – Measuring Bearings & arriving included angles.

LEVELLING - STUDY OF LEVELS AND LEVELLING STAFF

1. Fly levelling using Dumpy level &Tilting level.
2. Check levelling.

THEODOLITE - STUDY OF THEODOLITE

1. Measurements of horizontal angles by reiteration and repetition and vertical angles.
2. Determination of elevation of an object using single plane method when base is Accessible/inaccessible.

TACHEOMETRY – TANGENTIAL SYSTEM – STADIA SYSTEM

1. Determination of Tacheometric Constants.
2. Heights and distances by stadia Tacheometry.
3. Heights and distances by Tangential Tacheometry.

TOTAL STATION - STUDY OF TOTAL STATION, MEASURING HORIZONTAL AND VERTICAL ANGLES

1. Traverse using Total station and Area of Traverse.
2. Determination of distance and difference in elevation between two inaccessible points using Total station.

TOTAL: 30 PERIODS

COURSE OUTCOMES:

At the end of the course the students will be able to

CO1: Apply basic principles to compute distances and angles using conventional equipment.

CO2: Determine levels and relative position of stations by various levelling instruments.

CO3: Calculate heights, distances, and horizontal and vertical angles using theodolite.

CO4: Apply precaution, adjustment, and correction methods to erroneous survey observations.

CO5: Outline the concept and principle of modern surveying.

CO6: Apply advanced surveying practices using EDM and GPS in modern surveying.

TEXT BOOKS:

1. Kanetkar. T.P and Kulkarni. S.V, "Surveying and Levelling, Parts 1 & 2", Pune Vidyarthi Griha Prakashan, Pune, 2008.
2. Punmia B.C, Ashok K. Jain and Arun K Jain, "Surveying Vol. I & II", Lakshmi Publications Pvt Ltd, New Delhi, 2005.

REFERENCE BOOKS:

1. Alfred Leick, "GPS satellite surveying", John Wiley & Sons Inc., 3rd Edition, 2004.
2. Guocheng Xu, "GPS Theory , Algorithms and Applications", Springer – Berlin, 2003.
3. Satheesh Gopi, Rasathish Kumar, N. Madhu, "Advanced Surveying, Total Station GPS and Remote Sensing" Pearson education, 2007.
4. Roy S.K., "Fundamentals of Surveying", 2nd Edition, Prentice Hall of India, 2004.

COs	**POs**												**PSOs**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
1	2	2	3	2	2	3	-	2	2	-	2	-	3	3	3
2	3	3	2	2	2	3	-	2	2	-	2	-	3	3	3
3	3	3	3	2	3	3	-	2	2	-	2	-	3	3	3
4	3	3	3	3	3	3	2	2	3	-	2	2	3	3	3
5	3	3	3	3	3	3	2	3	2	-	2	2	3	3	3
6	3	3	3	3	3	3	2	3	2	-	2	2	3	3	3
Overall correlation	3	3	3	3	3	3	2	2	2	0	2	2	3	3	3

23CE312	**ADVANCED CONCRETE TECHNOLOGY**	**L**	**T**	**P**	**C**
		3	**0**	**2**	**4**

COURSE OBJECTIVES:

- To study the properties of concrete making materials.
- To understand the application and effect of admixtures.
- To familiarize with the IS method of mix design as per the latest code and the properties of concrete.
- To familiarize with durability properties of concrete.
- To know the importance and applications of special concretes.

UNIT I CONSTITUENT MATERIALS 9

Cement-Different types-Chemical composition and Properties -Tests on cement-IS Specifications- Aggregates-Classification-Mechanical properties and tests as per BIS grading requirements-Water- Quality of water for use in concrete.

UNIT II ADMIXTURES 9

Accelerators-Retarders- Plasticizers- Super plasticizers- Water proofers - Mineral Admixtures like Fly Ash, Silica Fume, Ground Granulated Blast Furnace Slag and Metakaoline -Their effects on concrete properties.

UNIT III PROPORTIONING & PROPERTIES OF CONCRETE 9

Design Mix and Nominal Mix-BIS Method of Mix Design - Mix Design Examples-Workability-Tests for workability of concrete-Slump Test and Compacting factor Test-Segregation and Bleeding-Determination of Compressive and Flexural strength as per BIS - Properties of Hardened concrete- Stress-strain curve for concrete-Determination of Modulus of elasticity.

UNIT IV DURABILITY OF CONCRETE 9

Definitions - Deterioration processes – Physical, Chemical, Environmental & Biological; Measures for durability, Corrosion of reinforcing steel, protective measures. Durability issues in concretes –carbonation – sulphate attack – chloride attack – permeability, Acid attack – Seawater attack etc.

UNIT V SPECIAL CONCRETES 9

Light weight concretes - High strength concrete - Fibre reinforced concrete – Ferrocement - Ready mix concrete - SIFCON - Shotcrete – Polymer concrete - High performance concrete- self compacting concrete - Geopolymer Concrete – No fines concrete –Cellular concrete.

TOTAL: 45 PERIODS

LIST OF EXPERIMENTS

1. Mix design of concrete as per IS methods for high performance concrete.
2. Fresh properties of concrete with relevance to workability.
3. Hardened properties of concrete with relevance to strength.
4. Flow Characteristics of Self Compacting concrete.
5. Non Destructive Test on hardened concrete-UPV, Rebound hammer and core test.
6. Durability tests on hardened concrete–Demonstration.

TOTAL: 30 PERIODS

COURSE OUTCOMES:

At the end of the course the students will be able to

CO1: Illustrate the requirements of cement, aggregates, water in concrete.

CO2: Interpret the effect of admixtures in concrete.

CO3: Design concrete mixes as per IS method of mix design.

CO4: Demonstrate the properties of concrete at fresh and hardened state.

CO5: Demonstrate the durability properties of concrete.

CO6: Interpret the importance of special concretes for specific requirements.

TEXT BOOKS:

1. Shetty.M.S, "Concrete Technology", S.Chand and Company Ltd, New Delhi, 2003.
2. Gupta.B.L., Amit Gupta, "Concrete Technology", Jain Book Agency, 2010.

REFERENCE BOOKS:

1. Neville, A.M; "Properties of Concrete", Pitman Publishing Limited, London, 1995.
2. Gambhir.M.L. “Concrete Technology”, Fifth Edition, McGraw Hill Education, 2017.
3. Job Thomas., “Concrete Technology”, Cencage learning India Private Ltd, New Delhi, 2015.
4. IS10262-2019 Recommended Guidelines for Concrete Mix Design, Bureau of Indian Standards, New Delhi.

COs	POs												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	3	-	1	2	-	3	3	2	1	1	1	2	3	2	3
2	3	1	3	3	-	3	3	1	1	1	1	2	3	2	3
3	3	-	1	2	-	3	3	2	1	1	1	2	3	2	3
4	3	-	1	2	-	3	3	2	1	1	1	2	3	2	3
5	3	-	1	2	-	3	3	2	1	1	1	2	3	2	3
6	3	-	1	2	-	3	3	2	1	1	1	2	3	2	3
Overall correlation	3	1	2	2	-	3	3	2	1	1	1	2	3	2	3

23ME312 FLUID MECHANICS AND HYDRAULIC MACHINERY

	L	T	P	C
	3	0	2	4

COURSE OBJECTIVES:

- Study about the properties of the fluids and behavior of fluids under static conditions.
- Gain basic knowledge of the dynamics of fluids and boundary layer concepts.
- Study the applications of the conservation laws to flow measurements, flow through pipes and forces on pipe bends.
- Learn the significance of boundary layer theory and its thicknesses.
- Study the basic principles of working and design of Pelton wheel, Francis and Kaplan turbine.
- Acquire knowledge on working principles of centrifugal, reciprocating and rotary pumps.

UNIT I FLUID PROPERTIES AND FLOW CHARACTERISTICS 9

Fluid Definition and Classification – Properties of fluids, Fluid statics - Pressure Measurements - Buoyancy and floatation - forces on submerged bodies, stability of floating bodies, Flow characteristics - Concept of control volume – Applications of Continuity equation, energy equation and momentum equation.

UNIT II FLOW THROUGH PIPES AND BOUNDARY LAYER 9

Reynold's Experiment - Laminar flow through circular conduits - Darcy Weisbach equation - friction factor - Moody diagram - Major and minor losses - Hydraulic and energy gradient lines - Pipes in series and parallel - Boundary layer concepts - Types of boundary layer thickness.

UNIT III DIMENSIONAL ANALYSIS AND MODEL STUDIES 9

Fundamental dimensions - Dimensional homogeneity - Rayleigh's method and Buckingham Pi theorem - Dimensionless parameters - Similitude and model studies - Distorted and undistorted models.

UNIT IV TURBINES 10

Impact of jets - Velocity triangles - Theory of rotodynamic machines - Classification of turbines - Working principles - Pelton wheel - Francis turbine - Kaplan turbine - Work done - Efficiencies - Draft tube - Specific speed - Performance curves for turbines - Governing of turbines.

UNIT V PUMPS 8

Classification of pumps - Centrifugal pumps - Working principle - Heads and efficiencies– Velocity triangles - Work done by the impeller - Performance curves - Reciprocating pump working principle - Indicator diagram and it's variations - Work saved by fitting air vessels - Rotary pumps.

LIST OF EXPERIMENTS

1. Determination of coefficient of discharge of a venturimeter.
2. Determination of coefficient of discharge of an orificemeter.
3. Determination of friction factor for flow through pipes.
4. Determination of metacentric height.
5. Characteristics of centrifugal pumps.
6. Characteristics of reciprocating pump.
7. Characteristics of gear pump.
8. Characteristics of Pelton wheel turbine.
9. Flow measurement using Rotameter.
10. Characteristics of Francis turbine.

TOTAL:45+30 PERIODS

COURSE OUTCOMES:

At the end of the course the

CO1: Apply the conservation laws applicable to fluids and its application through fluid kinematics and dynamics and also to understand the properties and behavior of fluids in static conditions.

CO2: Estimate the losses in pipelines for both laminar and turbulent conditions and analysis of pipes connected in series and parallel.

CO3: Apply the concept of boundary layer and its thickness on the flat solid surface.

CO4: Formulate the relationship among the parameters involved in the given fluid phenomenon and to predict the performances of prototype by model studies.

CO5: Design the various types of turbines and to explain its working principles.

CO6: Design the various types of pumps and to explain its working principles.

TEXT BOOKS:

1. Modi P.N. and Seth, S.M., "Hydraulics and Fluid Mechanics", Standard Book House,New Delhi 2017.
2. Bansal R.K, “A Text Book Fluid Mechanics and Hydraulic Machines”, Laxmi Publications (p) Ltd, 10th Edition, 2018.

REFERENCE BOOKS:

1. Frank M White, Fluid Mechanics” Mc Grawhill Education, 9th Edition, 2017.
2. Graebel. W.P, "Engineering Fluid Mechanics", Taylor & Francis, Indian Reprint, 2013.
3. Kumar K. L., "Engineering Fluid Mechanics", Eurasia Publishing House(p) Ltd., NewDelhi 2016.
4. Robert W.Fox, Alan T. McDonald, Philip J.Pritchard, “Fluid Mechanics and Machinery”, 2011.

COs	POs												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	3	3	3	-	1	-	-	-	-	-	-	-	3	3	-
2	3	3	3	1	1	2	-	-	-	-	-	-	3	3	-
3	3	2	3	2	2	-	-	-	-	-	-	-	3	3	-
4	3	3	3	-	2	-	-	-	-	-	-	-	3	3	-
5	3	3	3	-	2	-	-	-	-	-	-	-	3	3	-
6	3	3	3	-	2	-	-	-	-	-	-	-	3	3	-
Overall correlation	3	3	3	1	2	2	-	-	-	-	-	-	3	3	-

23CE321 COMPUTER AIDED BUILDING DRAWING LABORATORY

L	T	P	C
0	0	4	2

COURSE OBJECTIVES:

- To enable the students to draft the plan, elevation and sectional views of buildings.
- To encourage students to comply with development and control rules satisfying orientation and functional requirements as per National Building Code.

LIST OF EXPERIMENTS

1. Principles of planning and orientation.
2. Buildings with load bearing walls.
3. Buildings with sloping roof.
4. R.C.C. framed structures.
5. Industrial buildings – North light roof structures.
6. Building Information Modelling.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

At the end of the course the students will be able to

CO1: Illustrate the principles of planning.
CO2: Draft the plan, elevation and sectional view of load bearing buildings.
CO3: Draft the plan, elevation and sectional view of sloped roof buildings.
CO4: Sketch the plan, elevation and sectional view of framed buildings.
CO5: Sketch the plan, elevation and sectional view of industrial buildings.
CO6: Illustrate the concepts of building information modelling.

COs	POs												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	3	1	-	-	3	3	-	2	3	2	-	2	3	-	-
2	3	1	-	-	3	3	-	2	3	2	-	2	3	-	-
3	3	2	-	-	3	3	-	2	3	2	-	2	3	-	-
4	3	2	-	-	3	3	-	2	3	2	-	2	3	-	-
5	3	2	-	-	3	3	-	2	3	2	-	2	3	-	-
6	3	2	-	-	3	3	-	2	3	2	-	2	3	-	-
Overall correlation	3	2	-	-	3	3	-	2	3	2	-	2	3	-	-

23ES391 PRESENTATION SKILLS

	L	T	P	C
	0	**0**	**2**	**1***

COURSE OBJECTIVES:

- To help learners use brainstorming techniques for generating, organizing and outlining ideas.
- To familiarize learners with different speech structures by engaging them in watching speeches with great opening and closing.
- To give practice on voice modulation and use of body language and eye contact for making captivating presentations.
- To give hands on training on preparing presentation slides and using remote presentation tools.
- To train students on responding to question and feedback with confidence.

UNIT I BRAINSTORMING AND OUTLINING 6

Mind Mapping based on prior knowledge, collecting additional information from external resources, giving prompts to Generative AI tools seeking information, organizing ideas generated, knowing your audience.

UNIT II STRUCTURING THE PRESENTATION 6

3 Ts of a presentation, writing effective introduction- Beginning the introduction with a hook (question, data, storytelling) and closing the introduction with the objective of the presentation. Structuring the body paragraphs -Choosing key ideas from the list of ideas generated during brainstorming. Substantiating ideas with examples, data, reasons and anecdotes. Summarizing the ideas for conclusion.

UNIT III DELIVERY TECHNIQUES 6

Vocal variety, intonation, reducing filler words and improving articulation, inflection, engaging the audience. Body language- eye contact, gestures, movement on stage.

UNIT IV USE OF TECHNOLOGICAL AIDS 6

Use of presentation software like MS Power Point, Google Slides etc, incorporating images, graphs, charts and videos, using interactive tools like quizzes and polls, using remote presentation tools like zoom, MS Teams, WebEx for screen sharing, virtual whiteboards and chat functionalities, incorporating AR/VR for more immersive presentations .

UNIT V HANDLING QUESTIONS AND FEEDBACK 6

Audience engagement through questions, PAR (Point, Answer, Redirect) strategy for structuring responses to questions. Understanding feedback process - Receiving, interpreting and evaluating constructively, active listening techniques for processing feedback, responding to feedback- acknowledging, clarifying and appreciating, Dealing with challenging feedback.

TOTAL: 30 PERIODS

COURSE OUTCOMES:

After completion of the course, the students should be able to

CO1 construct ideas for presentation through mind mapping techniques.

CO2 organize ideas and structure the presentation with captivating introduction, body paragraphs illustrated with examples and reasons and compelling conclusion.

CO3 apply vocal variety and body language techniques to enhance delivery.

CO4 prepare engaging presentations by integrating multimedia elements.

CO5 demonstrate proficiency in delivering presentations in remote platforms utilizing various technological tools and strategies to engage audience in virtual environments.

CO6 exhibit active listening skills by responding to questions with clarity and confidence and incorporating constructive feedback for professional development.

TEXT BOOKS:

1. "Slide:ology: The Art and Science of Creating Great Presentations" by Nancy Duarte. O'Reilly Media.
2. "The Naked Presenter: Delivering Powerful Presentations With or Without Slides" by Garr Reynolds. New Riders.

REFERENCE BOOK:

Talk Like TED: The 9 Public-Speaking Secrets of the World's Top Minds" by Carmine Gallo.

23MA401	**OPTIMIZATION TECHNIQUES**	**L**	**T**	**P**	**C**
		3	**1**	**0**	**4**

COURSE OBJECTIVES:

- Formulate and solve linear programming problems (LPP).
- Evaluate Transportation and Assignment Problems.
- Obtain solution to network problems using CPM and PERT techniques.
- Optimize the function subject to the constraints.

UNIT I LINEAR PROGRAMMING MODELS 9+3

Introduction of Operations Research - mathematical formulation of LPP-Graphical Methods to solve LPP- Simplex Method- Big M method , Two phase method.

UNIT II TRANSPORTATION PROBLEMS AND ASSIGNMENT PROBLEMS 9+3

Transportation problem (TP) - finding basic feasible solution of TP using North-West Corner Rule, Least Cost and Vogel's Approximation Method - MODI method for finding optimal solution for TP - Assignment problem - Hungarian method for solving Assignment problem - Travelling salesman problem as assignment problem – Production Scheduling problem – Introduction, Problems in single machine scheduling.

UNIT III INVENTORY CONTROL 9+3

Introduction, Models – Problems in Purchase and Production (Manufacturing) models with and without shortages – Theory on types of inventory control systems: P& Q, ABC, VED, FNS, XYZ, SDE and HML.

UNIT IV PROJECT MANAGEMENT 9+3

Project definition - Gantt chart - Project network - Diagram representation – Floats - Critical path method (CPM) – PERT- Cost considerations in PERT and CPM.

UNIT V CLASSICAL OPTIMIZATION THEORY 9+3

Unconstrained problems – necessary and sufficient conditions - Newton-Raphson method, Constrained problems – equality constraints – inequality constraints - Kuhn-Tucker conditions.

TOTAL: 60 PERIODS

COURSE OUTCOMES:

At the end of the course the students will be able to

CO 1 Formulate and solve linear programming problems (LPP).

CO 2 Examine Transportation Problems.

CO 3 Examine Assignment Problems.

CO 4 Plan the purchase/ manufacturing policies to meet customer demands.

CO 5 Obtain solution to network problems using CPM and PERT techniques.

CO 6 Optimize the function subject to the constraints.

TEXT BOOKS:

1. Hamdy A Taha, Operations Research: An Introduction, Pearson, 10th Edition, 2017 .
2. R. Pannerselvan, Operations Research, 2nd Edition, PHI Publications, 2006.

REFERENCE BOOKS:

1. Dontzig G.B, Linear Programming and extensions, Princeton University Press.
2. ND Vohra, Quantitative Techniques in Management, Tata McGraw Hill, 4th Edition, 2011.
3. J. K. Sharma, Operations Research Theory and Applications, Macmillan, 5th Edition, 2012.

CO	POs												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	3	3	2	1	-	-	-	-	-	-	1	2	1	-	-
2	3	3	2	1	-	-	-	-	-	-	1	2	1	-	-
3	3	3	2	1	-	-	-	-	-	-	1	2	1	-	-
4	3	3	2	1	-	-	-	-	-	-	1	2	1	-	-
5	3	3	2	1	-	-	-	-	-	-	1	2	1	-	-
Overall correlation	3	3	2	1	-	-	-	-	-	-	1	2	1		

23CE401 TRANSPORTATION ENGINEERING

	L	T	P	C
	3	0	0	3

COURSE OBJECTIVES:

- To give an overview about the highway, railway, airport and harbor engineering with respect to, planning, design, construction and maintenance as per standards, specifications and methods.

UNIT I HIGHWAY ENGINEERING 9

Classification of highways – Institutions for Highway planning, design and construction at different levels – factors influencing highway alignment –Typical cross sections of Urban and Rural roads – Engineering surveys for alignment- Conventional and Modern method.

UNIT II HIGHWAY CONSTRUCTION AND MAINTANENCE 9

Highway construction materials, properties, testing methods – Construction practice of flexible and concrete pavement- Highway drainage – Evaluation and Maintenance of pavements – Expressways.

UNIT III RAILWAY PLANNING AND CONSTRUCTION 9

Elements of permanent way – Rails, Sleepers, Ballast, rail fixtures and fastenings, Selection of gauges - Track Stress, coning of wheels, creep in rails, defects in rails – Route alignment surveys, conventional and modern methods-Geometric design of railway, gradient, super elevation, widening of gauge on curves (Problems)-Railway drainage-Level Crossings-Signaling – Metrorail and Monorail.

UNIT IV AIRPORT PLANNING AND COMPONENTS 9

Air transport characteristics - airport classification – ICAO - airport planning: Site selection typical Airport Layouts, Case Studies, parking and Circulation Area -Airport Classification, Planning of Airfield Components – Runway, Taxiway, Apron, Hangar-Passenger Terminals- Airport drainage.

UNIT V SEAPORTS COMPONENTS AND CONSTRUCTION 9

Definition of Basic Terms: Harbor, Port, Satellite Port, Docks- Dry and Floating Dock, Waves and Tides – Planning and Design of Harbors: Harbour Layout and Terminal Facilities – Coastal Structures: Piers, Break waters, Wharves, Jetties, Quays, Spring Fenders, Dolphins Floating Landing Stage – Navigational Aids-Inland Water Transport.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

At the end of the course the students will be able to

CO1: Plan a highway according to the principles and standards adopted in various institutions in India.

CO2: Test the highway materials and construction practice methods and know its properties and able to perform pavement evaluation and management.

CO3: Design the elements in railway planning and constructions.

CO4: Demonstrate Knowledge on the planning and site selection of airport Planning.

CO5: Enumerate the various airport components.

CO6: Illustrate the various features in harbours and ports, their construction, coastal protection works.

TEXT BOOKS:

1. SubramanianK.P.,"Highways,Railways,AirportandHarbourEngineering",Scitech Publications (India), Chennai,2010.
2. C. Venkatramaiah., "Transportation Engineering-Vol.2 Railways, Airports, Docks and Harbours, Bridges and Tunnels", Universities Press (India) Private Limited, Hyderabad, 2015.

REFERENCE BOOKS:

1. Indian Road Congress (IRC), Guidelines for the Design of Flexible Pavements, (Third Revision), IRC:37-2012.
2. Indian Road Congress (IRC), Guidelines for the Design of Plain Jointed Rigid Pavements for Highways, (Third Revision), IRC:58-2012.
3. Yang H. Huang, "Pavement Analysis and Design", Pearson Education Inc, Nineth Impression, South Asia, 2012.
4. Ian D. Walsh, "ICE manual of highway design and management", ICE Publishers, Ist Edition, USA, 2011.

COs	POs												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	3	-	-	2	-	3	1	3	-	-	-	-	3	2	-
2	2	3	3	2	2	-	2	3	2	-	2	3	3	3	-
3	2	3	2	2	2	3	3	3	-	-	3	-	3	3	-
4	3	--	-	-	-	3	-	3	-	1	-	-	3	3	2
5	3	-	-	-	-	3	-	3	-	1	-	-	3	3	2
6	-	-	3	-	2	-	-	-	2	-	-	2	3	3	3
Overall correlation	2	3	3	2	2	3	2	3	2	1	3	3	3	3	2

23CE402	WATER SUPPLY AND WASTEWATER ENGINEERING	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To introduce students to various components and design of water supply scheme, water treatment methods, water storage distribution system, sewage treatment and disposal and deign of intake structures and sewerage system.

UNIT I WATER SUPPLY 9

Estimation of surface and subsurface water resources - Predicting demand for water- Impurities of water and their significance - Physical, chemical and bacteriological analysis - Waterborne diseases -Standards for potable water. Intake of water: Pumping and gravity schemes.

UNIT II WATER TREATMENT 9

Objectives - Unit operations and processes - Principles, functions, and design of water treatment plant units, aerators of flash mixers, Coagulation and flocculation — Clarifloccuator - Plate and tube settlers - Pulsator clarifier - sand filters - Disinfection - softening, removal of iron and manganese - Defluoridation - Softening - Desalination process - Residue Management - Construction, Operation and Maintenance aspects.

UNIT III WATER STORAGE AND DISTRIBUTION 9

Storage and balancing reservoirs - types, location and capacity. Distribution system: layout, hydraulics of pipe lines, pipe fittings, valves including check and pressure reducing valves, meters, analysis of distribution systems, leak detection, maintenance of distribution systems, pumping stations and their operations - House service connections.

UNIT IV PLANNING AND DESIGN OF SEWERAGE SYSTEM 9

Characteristics and composition of sewage - Population equivalent - Sanitary sewage flow estimation - Sewer materials - Hydraulics of flow in sanitary sewers - Sewer design - Storm drainage-Storm runoff estimation - Sewer appurtenances - Corrosion in sewers - Prevention and control — Sewage pumping-drainage in buildings - Plumbing systems for drainage.

UNIT V SEWAGE TREATMENT AND DISPOSAL 9

Objectives - Selection of Treatment Methods - Principles, Functions, - Activated Sludge Process andExtended aeration systems - Trickling filters - Sequencing Batch Reactor(SBR) - UASB - Waste Stabilization Ponds - Other treatment methods - Reclamation and Reuse of sewage - Recent Advances in Sewage Treatment - Construction, Operation and Maintenance aspects. - Discharge standards-sludge treatment -Disposal of sludge.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

At the end of the course the students will be able to

CO1: Illustrate the various components of water supply scheme and design of intake structure and conveyance system for water transmission.

CO2: Interpret the characteristics and composition of sewage, ability to estimate sewage generation and design sewer system including sewage pumping stations.

CO3: Classify the process of conventional treatment and design of water and wastewater treatment system and gain knowledge of selection of treatment process.

CO4: Evaluate water distribution system and water supply in buildings.

CO5: Design the self-purification of streams and sludge and sewage disposal methods.

CO6: Design the various advanced treatment system and knowledge aboutthe recent advances in water and wastewater treatment process and reuse of sewage.

TEXT BOOKS:

1. Garg, S.K., "Environmental Engineering, Vol.I & Vol.II", Khanna Publishers, New Delhi, 2010.
2. Modi, P.N., "Water Supply Engineering, Vol.I", Standard Book House, New Delhi, 2016.

REFERENCE BOOKS:

1. Punmia B.C, Ashok Jain and Arun Jain, "Water Supply Engineering", Laxmi Publications (P)Ltd., New Delhi 2010.
2. Manual on Water Supply and Treatment, CPHEEO, Ministry of Urban Development,Government of India, New Delhi, 1999.
3. Metcalf and Eddy, "Waste water Engineering – Treatment and Reuse", Tata Mc. Graw HillCompany, New Delhi, 2010.
4. Syed R.Qasim, "Waste water Treatment Plants", RCPress,WashingtonD.C.,2010

COs	**POs**												**PSOs**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
1	3	2	-	-	-	-	1	-	-	-	-	-	2	-	-
2	3	3	1	-	-	-	-	-	-	1	-	-	2	-	-
3	3	3	2	-	-	-	1	-	-	-	-	-	2	-	-
4	4	3	2	-	-	-		-	-	1	-	-	2	-	-
5	3	2	2	-	-	-	2	-	-	1	-	-	2	-	-
6	3	4	2	-	-	-	1	-	-	1	-	-	2	-	-
Overall correlation	3	3	2	-	-	-	1	-	-	1	-	-	3	-	-

23CE411 SOIL MECHANICS

L	T	P	C
3	0	2	4

COURSE OBJECTIVES:

- To impart knowledge to classify the soil based on index properties and to assess their engineering properties based on the classification.
- To familiarize the students about the fundamental concepts of compaction, flow through soil, stress transformation, stress distribution, consolidation and shear strength of soils.
- To impart knowledge of design of both finite and infinite slopes.

UNIT I SOIL CLASSIFICATION AND COMPACTION 9

Formation of soil - Soil description – Particle – Size shape and colour – Composition of gravel, sand, silt, clay particles – Particle behaviour – Soil structure – Phase relationship – Index properties – Significance – BIS classification system – Unified classification system – Compaction of soils – Theory, Laboratory and field tests – Field Compaction methods – Factors influencing compaction of soils.

UNIT II EFFECTIVE STRESS AND PERMEABILITY 9

Soil - water – Static pressure in water - Effective stress concepts in soils – Capillary phenomena– Permeability interaction – Hydraulic conductivity – Darcy's law – Determination of Hydraulic Conductivity – Laboratory Determination (Constant head and falling head methods) and field measurement pumping out in unconfined and confined aquifer – Factors influencing permeability of soils – Seepage - Two dimensional flow – Laplace's equation – Introduction to flow nets – Simple problems. (Sheet pile and weir).

UNIT III STRESS DISTRIBUTION AND SETTLEMENT 9

Stress distribution in homogeneous and isotropic medium – Boussinesq theory – (Point land, Line land and udl) Use of New marks influence chart –Components of settlement – – Immediate and consolidation settlement – Terzaghi's one dimensional consolidation theory – Computation of rate of settlement. - $\sqrt{t}$ and log t methods– e-log p relationship.

UNIT IV SHEAR STRENGTH 9

Shear strength of cohesive and cohesion less soils – Mohr-Coulomb failure theory – Measurement of shear strength - Direct shear, Triaxial compression, UCC and Vane shear tests – Pore pressure parameters – Cyclic mobility – Liquefaction.

UNIT V SLOPE STABILITY 9

Stability Analysis - Infinite slopes and finite slopes – Total stress analysis for saturated clay – Friction circle method – Use of stability number – Method of slices – Fellenious and Bishop's method - Slope protection measures.

TOTAL: 45 PERIODS

LIST OF EXPERIMENTS:

1. **DETERMINATION OF INDEX PROPERTIES**
   a. Specific gravity of soil solids.
   a. Grain size distribution – Sieve analysis.
   b. Grain size distribution - Hydrometer analysis.
   c. Liquid limit and Plastic limit tests.
   d. Shrinkage limit and Differential free swell tests.
2. **DETERMINATION OF INSITU DENSITY AND COMPACTION CHARACTERISTICS**
   a. Field Density Test (Sand replacement method).
   b. Determination of moisture–density relationship using standard proctor compaction test.
3. **DETERMINATION OF ENGINEERING PROPERTIES**
   a. Permeability determination (constant head and falling head methods).
   b. One-dimensional consolidation test (Determination of co-efficient of consolidation only).
   c. Direct shear test in cohesion less soil.
   d. Unconfined compression test in cohesive soil.
   e. Laboratory vane shear test in cohesive soil.
   f. Tri-axial compression test in cohesion-less soil (Demonstration only).
   g. California Bearing Ratio Test.
4. **TEST ON GEOSYNTHETICS (Demonstration only)**
   a. Determination of tensile strength and interfacial friction angle.
   b. Determination of apparent opening sizes and permeability.

TOTAL: 30 PERIODS

COURSE OUTCOMES:

At the end of the course the students will be able to

CO1: Apply the basic principles to classify the soil and assess the engineering properties, based on index properties.
CO2: Summarize the stress concepts in soils.
CO3: Interpret and identify the settlement in soils.
CO4: Analyze the shear strength of soil.
CO5: Apply stability measures to both finite and infinite slopes.
CO6: Analyze stress distribution and protect the slope.

TEXT BOOKS:

1. Murthy, V.N.S., "Soil Mechanics and Foundation Engineering", CBS Publishers Distribution Ltd., New Delhi. 2015.
2. Gopal Ranjan and Rao, A.S.R., "Basic and Applied Soil Mechanics", New Age Ltd. International Publisher New Delhi (India) 2006.

REFERENCE BOOKS:

1. McCarthy, D.F., "Essentials of Soil Mechanics and Foundations", Prentice-Hall, 2006.
2. Coduto, D.P., "Geotechnical Engineering – Principles and Practices", Prentice Hall of India Pvt.Ltd. New Delhi, 2010.
3. Das, B.M., "Principles of Geotechnical Engineering". Brooks / Coles / Thompson Learning Singapore, 8th Edition, 2013.
4. Punmia, B.C., "Soil Mechanics and Foundations", Laxmi Publications Pvt. Ltd. New Delhi, 2005.

COs	POs												PSOs		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
1	3	2	-	-	-	-	1	-	-	-	-	-	2	-	-
2	3	3	1	-	-	-	-	-	-	1	-	-	2	-	-
3	3	3	2	-	-	-	1	-	-	-	-	-	2	-	-
4	4	3	2	-	-	-		-	-	1	-	-	2	-	-
5	3	2	2	-	-	-	2	-	-	1	-	-	2	-	-
6	3	4	2	-	-	-	1	-	-	1	-	-	2	-	-
Overall correlation	3	3	2	-	-	-	1	-	-	1	-	-	3	-	-

23CE412 STRENGTH OF MATERIALS

	L	T	P	C
	3	0	2	4

COURSE OBJECTIVES:

- To understand the concepts of stress, strain, principal stresses and principal planes.
- To study the concept of shearing force and bending moment due to external loads in determinate beams and their effect on stresses.
- To determine stresses and deformation in circular shafts and helical spring due to torsion.
- To compute slopes and deflections in determinate beams by various methods.
- To study the stresses and deformations induced in thin and thick shells.

UNIT I STRESS, STRAIN AND DEFORMATION OF SOLIDS 9+6

Rigid bodies and deformable solids – Tension, Compression and Shear Stresses – Deformation of simple and compound bars – Thermal stresses – Elastic constants, Poisson's ratio – Volumetric strains – Stresses on inclined planes – principal stresses and principal planes – Mohr's circle for plane stress.

UNIT II TRANSVERSE LOADING ON BEAMS AND STRESSES IN BEAMS 9+6

Beams – types transverse loading on beams – Shear force and bending moment in beams – Cantilevers – Simply supported beams and over – hanging beams. Theory of simple bending– bending stress distribution – Load carrying capacity – Proportioning of sections– Shear stress distribution.

UNIT III DEFLECTION OF BEAMS 9+6

Double Integration method – Macaulay's method – Area moment method- Conjugate beam method for computation of slopes and deflections in determinate beams.

UNIT IV TORSION, SPRINGS AND COLUMNS 9+6

Theory of Torsion - Stresses and deformations in solid and hollow circular shafts – Stepped shafts – Power transmitted by a shaft.
Helical springs – Differences between closely coiled and open coiled helical springs – Closely coiled helical springs – Calculation of shear stress, deflection and stiffness.
Columns – Euler's theory – Calculation of crippling load for different end conditions for a long column.

UNIT V THIN CYLINDERS, SPHERES AND THICK CYLINDERS 9+6

Stresses in thin and thick cylindrical shell, deformation in thin and thick cylinders – spherical shells subjected to internal pressure –Deformation in spherical shells.

LIST OF EXPERIMENTS

1. Tension test on mild steel rod
2. Double shear test on mild steel rod
3. Torsion test on mild steel rod
4. Izod Impact test on metal specimen
5. Charpy Impact test on metal specimen
6. Rockwell Hardness test on metals
7. Brinell Hardness test on metals
8. Compression test on helical spring.
9. Heat Treatment Processes- Annealing, Normalizing, Quenching and Tempering
10. Jominy End Quench Test

TOTAL: 45 + 30 PERIODS

COURSE OUTCOMES:

At the end of the course the students will be able to

CO1: Calculate the different stresses developed in the solids when subjected to different loading conditions.

CO2: Interpret the shear force and bending moment diagrams of the beams under the various loading conditions.

CO3: Examine the bending stress and shear stress distribution of various sections of the beam.

CO4: Calculate the slope and deflection of beams using different methods.

CO5: Apply the basic equations to design shafts, springs and columns.

CO6: Calculate the stresses developed in the thin cylinder, thick cylinder, and spherical shells.

TEXT BOOKS:

1. Bansal, R.K., "Strength of Materials", Laxmi Publications (P) Ltd., 2016.
2. Rattan S.S., “Strength of Materials", Tata McGraw Hill Education Pvt. Ltd., New Delhi, 2017.

REFERENCE BOOKS:

1. Rajput R.K. “Strength of Materials (Mechanics of Solids)", S.Chand & company Ltd., New Delhi, 7th edition, 2018.
2. Egor P Popov, “Engineering Mechanics of Solids”, 2nd edition, PHI Learning Pvt. Ltd., New Delhi, 2015.
3. Beer. F.P. & Johnston. E.R. “Mechanics of Materials”, Tata McGraw Hill, 8th Edition, New Delhi 2019.

4. Subramanian R., "Strength of Materials", Oxford University Press, Oxford Higher Education Series, 2010.

Cos	POs												PSOs		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
1	3	2	1	1	1	1	-	-	2	-	-	-	3	1	-
2	3	2	1	1	1	1	-	-	2	-	-	-	3	1	-
3	3	2	1	1	1	1	-	-	2	-	-	-	3	1	-
4	3	2	1	1	1	1	-	-	2	-	-	-	3	1	-
5	3	2	1	1	1	1	-	-	2	-	-	-	3	1	-
6	3	2	1	1	1	1	-	-	2	-	-	-	3	1	-
Overall correlation	3	2	1	1	1	1	-	-	2	-	-	-	3	1	-

23CE421	WATER AND WASTEWATER ANALYSIS LABORATORY	L	T	P	C
		0	0	4	2

COURSE OBJECTIVES:

- This subject includes the list of experiments to be conducted for characterization of water and municipal sewage. At the end of the course, the student is expected to be aware of the procedure for quantifying quality parameters for water and sewage.

LIST OF EXPERIMENTS :

1. Sampling and preservation methods for water and wastewater (Demonstration only).
2. Measurement of Electrical conductivity and turbidity.
3. Determination of fluoride in water by spectrophotometric method / ISE.
4. Determination of iron in water (Demo).
5. Determination of Sulphate in water.
6. Determination of Phosphates in water.
7. Determination of Optimum Coagulant Dosage by Jar test apparatus.
8. Determination of available Chlorine in Bleaching powder and residual chlorine in water.

ANALYSIS OF WASTEWATER SAMPLE

9. Estimation of suspended, volatile and fixed solids.
10. Determination of Sludge Volume Index in waste water.
11. Determination of Dissolved Oxygen.
12. Estimation of B.O.D.
13. Estimation of C.O.D.
14. Determination of TKN and Ammonia Nitrogen in wastewater.
15. Determination of total and faecal coliform (Demonstration only).

TOTAL: 45 PERIODS

COURSE OUTCOMES:

At the end of the course the students will be able to

CO1: Calibrate and standardize the equipment.
CO2: Collect proper sample for analysis.
CO3: Choose the sample preservation methods.
CO4: Experiment field oriented testing of water.
CO5: Experiment field oriented testing of wastewater.
CO6: Perform coliform analysis.

REFERENCE BOOKS:

1. APHA, "Standard Methods for the Examination of Water and Waste water", 22nd Ed.Washington, 2012.
2. "Laboratory Manual for the Examination of water, wastewater soil Rump", H.H. and Krist,H., Second Edition, VCH, Germany, 3rd Edition, 1999.
3. "Methods of air sampling & analysis", James P.Lodge Jr (Editor), 3rd Edition, Lewis publishers, Inc,USA,1989.

COs	POs												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	3	2	-	-	-	-	1	-	-	-	-	-	2	-	-
2	3	3	1	-	-	-	-	-	-	1	-	-	2	-	-
3	3	3	2	-	-	-	1	-	-	-	-	-	2	-	-
4	4	3	2	-	-	-		-	-	1	-	-	2	-	-
5	3	2	2	-	-	-	2	-	-	1	-	-	2	-	-
6	3	4	2	-	-	-	1	-	-	1	-	-	2	-	-
Overall correlation	3	3	2	-	-	-	1	-	-	1	-	-	3	-	-

23ES491 APTITUDE AND LOGICAL REASONING –I

	L	T	P	C
	0	0	2	1

COURSE OBJECTIVES:

- To improve the problem solving and logical thinking ability of the students.
- To acquaint student with frequently asked questions and patterns in quantitative aptitude and logical reasoning.

UNIT I **4**

Numbers, LCM, HCF, Averages, Ratio & Proportion, Mixtures & Allegation.

UNIT II **4**

Percentages, Time and work, Pipes and Cistern, coding and decoding

UNIT III **4**

Time Speed Distance, Train, Boats and Streams, Analogy

UNIT IV **4**

Data Interpretation(BAR,PIE,LINE), Seating arrangement

UNIT V **4**

Simple Interest and Compound Interest, Profit loss and Discount, Partnership,

TOTAL: 20 PERIODS

COURSE OUTCOMES:

At the end of the course the students will be able to

CO 1 Understand the basic concepts of quantitative ability.

CO 2 Understand the basic concepts of logical reasoning skills.

CO 3 Increase in critical thinking skills.

CO 4 Able to solve campus placements aptitude papers covering Quantitative Ability, Logical Reasoning Ability.

TEXT BOOK:

APTIPEDIA, 2nd edition, Wiley Publishers.

REFERENCE BOOKS:

1. Quantitative Aptitude – R.S. Agarwal
2. A Modern Approach To Verbal & Non-Verbal Reasoning By R S Agarwal.

KCG COLLEGE OF TECHNOLOGY (AUTONOMOUS)
REGULATIONS 2023
BE - ELECTRICAL AND ELECTRONICS ENGINEERING
CHOICE BASED CREDIT SYSTEM
CURRICULA FOR SEMESTERS I TO VIII

SEMESTER – I

SL. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
	23IP101	Induction Programme		-	-	-	-	0
THEORY								
1	23HS101	Essential Communication	HSMC	3	0	0	3	3
2	23MA101	Matrices and Calculus	BSC	3	0	0	3	3
3	23AD101	Programming in Python	ESC	3	0	0	3	3
4	23HS102	Heritage of Tamils	HSMC	1	0	0	1	1
THEORY AND PRACTICALS (INTEGRATED COURSE)								
5	23PH111	Engineering Physics	BSC	3	0	2	5	4
6	23CY111	Engineering Chemistry	BSC	3	0	2	5	4
PRACTICALS								
7	23AD121	Python Programming Laboratory	ESC	0	0	4	4	2
8	23HS121	Communication skills Laboratory	HSMC	0	0	2	2	1
9	23HS122	General Clubs / Technical Clubs / NCC / NSS / Extension Activities*	HSMC	0	0	2	2	1*
TOTAL				**16**	**0**	**12**	**28**	**21**

SEMESTER – II

Sl. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
THEORY								
1	23HS201	Professional English	HSMC	3	0	0	3	3
2	23MA201	Vector Calculus and Complex functions	BSC	3	1	0	4	4
3	23PH204	Physics for Electrical Engineering	BSC	3	0	0	3	3
4	23EE201	Electric Circuit Analysis	PCC	3	1	0	4	4
5	23ME271	Basic Mechanical and Building Sciences	ESC	3	0	0	3	3
6	23HS203	Tamils and Technology	HSMC	1	0	0	1	1
THEORY AND PRACTICALS (INTEGRATED COURSE)								
7	23ME211	Engineering Graphics	ESC	3	0	2	5	4
PRACTICALS								
8	23ME221	Engineering Practices Laboratory	ESC	0	0	4	4	2
9	23EE221	Electric Circuits Laboratory	PCC	0	0	4	4	2
10	23ES291	Soft Skills	EEC	0	0	2	2	1*
TOTAL				**19**	**2**	**12**	**33**	**26**

*** The grades earned by the students will be recorded in the Mark Sheet. However, the same shall not be considered for the computation of CGPA**

SEMESTER III

SL. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK L	T	P	TOTAL CONTACT PERIODS	CREDITS
THEORY								
1	23MA303	Transforms, Partial Differential Equations and Probability	BSC	3	1	0	4	4
2	23EE301	DC Machines and Transformers	PCC	3	0	0	3	3
3	23EE302	Electronic Devices and Integrated Circuits	PCC	3	0	0	3	3
4	23EE303	Electromagnetic Theory	PCC	3	0	0	3	3
5	23HS301	Universal Human Values and Ethics	HSMC	3	0	0	3	3
THEORY AND PRACTICALS (INTEGRATED COURSE)								
6	23CS381	C Programming and Data Structures	PCC	3	0	2	5	4
PRACTICALS								
7	23EE321	DC Machines and Transformers Laboratory	PCC	0	0	4	4	2
8	23EE322	Electronic Devices and Integrated Circuits Laboratory	PCC	0	0	4	4	2
9	23ES391	Presentation Skills	EEC	0	0	2	2	1*
TOTAL				**18**	**1**	**12**	**31**	**24**

SEMESTER IV

SL. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK L	T	P	TOTAL CONTACT PERIODS	CREDITS
THEORY								
1	23MA403	Numerical And Statistical Methods	BSC	3	1	0	4	4
2	23EE401	Induction and Synchronous Machines	PCC	3	0	0	3	3
3	23EE402	Microprocessor and Microcontroller Systems	PCC	3	0	0	3	3
4	23EE403	Measurements and Instrumentation	PCC	3	0	0	3	3
5	23EE404	Transmission and Distribution	PCC	3	0	0	3	3
THEORY AND PRACTICALS (INTEGRATED COURSE)								
6	23EE411	Digital Logic Circuits	PCC	2	0	2	4	3
PRACTICALS								
7	23EE421	Induction and Synchronous Machines Laboratory	PCC	0	0	4	4	2
8	23EE422	Microprocessor and Microcontroller Systems Laboratory	PCC	0	0	4	4	2
9	23ES491	Aptitude and Logical Reasoning - 1	EEC	0	0	2	2	1*
10	23EE423	In-Plant Training / Industry Certification Courses	EEC	0	0	2	2	1
TOTAL				**17**	**1**	**14**	**32**	**24**

SEMESTER V

SL. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
THEORY								
1	23RE501	Research Methodology and Intellectual Property Rights	ESC	2	0	0	2	2
2	23EE501	Power Electronics	PCC	3	0	0	3	3
3	23EE502	Power System Analysis	PCC	3	1	0	4	4
4		Department Elective 1	DEC	3	0	0	3	3
5		Non-Department Elective - 1 (Emerging Technology)	NEC	3	0	0	3	3
THEORY AND PRACTICALS (INTEGRATED COURSE)								
6	23EE511	Control Systems	PCC	3	0	2	5	4
PRACTICALS								
7	23EE521	Power Electronics Laboratory	PCC	0	0	4	4	2
8	23EE522	Mini Project	EEC	0	0	4	4	2
9	23ES591	Aptitude and Logical Reasoning -2	EEC	0	0	2	2	1*
TOTAL				**17**	**1**	**12**	**30**	**23**

SEMESTER VI

SL. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
THEORY								
1		Department Elective 2	DEC	3	0	0	3	3
2		Department Elective 3	DEC	3	0	0	3	3
3		Department Elective 4	DEC	3	0	0	3	3
4		Non-Department Elective - 2 (Management /Safety Courses)	NEC	3	0	0	3	3
THEORY AND PRACTICALS (INTEGRATED COURSE)								
5	23CE611	Environmental Sciences and Engineering	ESC	3	0	2	5	4
6	23EE611	Renewable Energy Systems	PCC	3	0	2	5	4
PRACTICALS								
7	23EE621	Project Work - Phase 1	EEC	0	0	4	4	2
8	23EE622	Technical Training	EEC	0	0	2	2	1
9	23EE623	Technical Seminar– 1	ESC	0	0	2	2	1
TOTAL				**18**	**0**	**12**	**30**	**24**

SEMESTER VII

SL. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
THEORY								
1		Non-Department Elective - 3 (Management Courses)	NEC	3	0	0	3	3
2		Department Elective 5	DEC	3	0	0	3	3
3		Department Elective 6	DEC	3	0	0	3	3
4	23EE701	Technical Comprehension	EEC	2	0	0	2	2
THEORY AND PRACTICALS (INTEGRATED COURSE)								
5	23EE711	Power System Protection and Control	PCC	3	0	2	5	4
PRACTICALS								
6	23EE721	Project Work - Phase 2	EEC	0	0	6	6	3
7	23EE722	Technical Seminar – 2	ESC	0	0	4	4	2
TOTAL				**14**	**0**	**12**	**26**	**20**

SEMESTER VIII

SL. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
PRACTICALS								
1	23EE821/ 23EE822	Internship / Capstone Project	EEC	0	0	20	20	10
TOTAL				**0**	**0**	**20**	**20**	10

TOTAL CREDITS: 172

DEPARTMENT ELECTIVE COURSES: VERTICALS

VERTICAL 1: - CONVERTERS AND DRIVES

SL. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1	23EE031	Advanced Power Semiconductor Devices	DEC	3	0	0	3	3
2	23EE032	Multi-Level Power Converters	DEC	2	0	2	4	3
3	23EE033	Power Electronics for Renewable Energy Systems	DEC	2	0	2	4	3
4	23EE034	Special Electrical Machines	DEC	2	0	2	4	3
5	23EE035	SMPS & UPS	DEC	3	0	0	3	3
6	23EE036	Solid State Drives	DEC	3	0	0	3	3
7	23EE037	Control of Power Electronics Circuits	DEC	2	0	2	4	3
8	23EE038	Analysis of Electrical Machines	DEC	3	0	0	3	3

VERTICAL 2: ELECTRIC VEHICLES TECHNOLOGY

SL. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1	23EE039	Electric Vehicle Architecture	DEC	3	0	0	3	3
2	23EE040	Design of Electric Vehicle Charging System	DEC	2	0	2	4	3
3	23EE041	Intelligent Control of Electric Vehicles	DEC	2	0	2	4	3
4	23EE042	Grid Integration of Electric Vehicles	DEC	3	0	0	3	3
5	23EE043	Testing of Electric Vehicles	DEC	2	0	2	4	3
6	23EE044	Design of Motor and Power Converters for Electric Vehicles	DEC	2	0	2	4	3
7	23EE045	Embedded System for Automotive Applications	DEC	2	0	2	4	3

VERTICAL 3: GREEN ENERGY TECHNOLOGIES

SL. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1	23EE046	Solar Energy Systems	DEC	3	0	0	3	3
2	23EE047	Wind Energy Conversion System	DEC	3	0	0	3	3
3	23EE048	Energy Storage Systems	DEC	3	0	0	3	3
4	23EE049	Distributed Generation and Microgrid	DEC	3	0	0	3	3
5	23EE050	Grid Integration Challenges for RES	DEC	3	0	0	3	3
6	23EE051	Smart Grids	DEC	3	0	0	3	3
7	23EE052	Hybrid Energy Technology	DEC	3	0	0	3	3

VERTICAL 4: POWER ENGINEERING

SL. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1	23EE053	Utilization and Conservation of Electrical Energy	DEC	3	0	0	3	3
2	23EE054	HVDC Transmission	DEC	3	0	0	3	3
3	23EE055	Energy Management and Auditing	DEC	3	0	0	3	3
4	23EE056	Flexible AC Transmission Systems	DEC	3	0	0	3	3
5	23EE057	Power System Transients	DEC	3	0	0	3	3
6	23EE058	High Voltage Engineering	DEC	3	0	0	3	3
7	23EE059	Power Quality	DEC	3	0	0	3	3
8	23EE060	Restructured Power Market	DEC	3	0	0	3	3

VERTICAL 5: DIVERSIFIED COURSES

SL. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1	23EE061	VLSI Design	DEC	3	0	0	3	3
2	23EE062	PLC Programming	DEC	3	0	0	3	3
3	23EE063	Wearable Electronics	DEC	3	0	0	3	3
4	23EE064	Embedded Systems	DEC	3	0	0	3	3
5	23EE065	Neural Network and Fuzzy Systems for Electrical Engineers	DEC	3	0	0	3	3
6	23EE066	IoT for Power Systems	DEC	3	0	0	3	3

NON-DEPARMENT ELECTIVE

EMERGING TECHNOLOGY

SL NO	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1	23NE973	Artificial Intelligence and Machine Learning Fundamentals	NEC	3	0	0	3	3
2	23NE974	Augmented Reality and Virtual Reality	NEC	3	0	0	3	3
3	23NE975	IoT concepts and applications	NEC	3	0	0	3	3
4	23NE976	Data Science and Fundamentals	NEC	3	0	0	3	3
5	23NE981	Integrated Energy Planning for Sustainable Development	NEC	3	0	0	3	3
6	23NE986	Foundation of Robotics	NEC	3	0	0	3	3
7	23NE988	Electric and Hybrid Vehicles	NEC	3	0	0	3	3
8	23NE989	Wearable Devices	NEC	3	0	0	3	3

MANAGEMENT COURSES

SL NO	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1	23HS971	Total Quality Management	NEC	3	0	0	3	3
2	23HS972	Engineering Economics and Financial Accounting	NEC	3	0	0	3	3
3	23HS973	Engineering Management and Law	NEC	3	0	0	3	3
4	23HS974	Knowledge Management	NEC	3	0	0	3	3
5	23HS975	Industrial Management	NEC	3	0	0	3	3
6	23HS976	Entrepreneurship and Business Opportunities	NEC	3	0	0	3	3
7	23HS977	Modern Business Administration and Financing	NEC	3	0	0	3	3
8	23HS978	Essentials of Management	NEC	3	0	0	3	3

SAFETY COURSES

SL NO	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1	23HS979	Disaster Management	NEC	3	0	0	3	3
2	23HS980	Industrial Safety	NEC	3	0	0	3	3
3	23HS981	Automotive Safety	NEC	3	0	0	3	3

SEMESTER-WISE CREDIT DISTRIBUTION – KCG EEE CURRICULUM

SEMESTER	HSMC	BSC	ESC	PCC	DEC	NEC	EEC	Total
Semester I	**5**	**11**	**5**					**21**
Semester II	**4**	**7**	**9**	**6**				**26**
Semester III	**3**	**4**		**17**				**24**
Semester IV		**4**		**19**			**1**	**24**
Semester V			**2**	**13**	**3**	**3**	**2**	**23**
Semester VI			**5**	**4**	**9**	**3**	**3**	**24**
Semester VII			**2**	**4**	**6**	**3**	**5**	**20**
Semester VIII							**10**	**10**
Total	**12**	**26**	**23**	**63**	**18**	**9**	**21**	**172**

23MA303	TRANSFORMS, PARTIAL DIFFERENTIAL EQUATIONS AND PROBABILITY	L	T	P	C
		3	1	0	4

COURSE OBJECTIVES:

- To introduce the basic concepts of PDE for solving standard partial differential equations.
- To introduce Fourier series analysis which is central to many applications in engineering apart from its use in solving boundary value problems.
- To acquaint the student with Fourier transform techniques used in wide variety of situations.
- To develop Z transform techniques for discrete time systems
- To introduce the basic concepts of probability and random variables

UNIT I PARTIAL DIFFERENTIAL EQUATIONS 9+3

Formation of partial differential equations –Solutions of standard types of first order partial differential equations - Lagrange's linear equation - Linear partial differential equations of second and higher order with constant coefficients of both homogeneous and non-homogeneous types.

UNIT II FOURIER SERIES 9+3

Dirichlet's conditions – General Fourier series – Odd and even functions – Half range sine series and cosine series – Root mean square value – Parseval's identity – Harmonic analysis.

UNIT III FOURIER TRANSFORMS 9+3

Statement of Fourier integral theorem– Fourier transform pair – Fourier sine and cosine transforms – Properties – Transforms of simple functions – Convolution theorem (Statement Only) – Parseval's identity.

UNIT IV Z-TRANSFORMS AND DIFFERENCE EQUATIONS 9+3

Z-transforms - Elementary properties – Convergence of Z-transforms – Initial and final value theorems - Inverse Z-transform using partial fraction and convolution theorem - Formation of difference equations – Solution of difference equations using Z - transforms.

UNIT V PROBABILITY AND RANDOM VARIABLES 9+3

Axioms of probability – Conditional probability - Discrete and continuous random variables – Moments – Moment generating functions – Binomial, Poisson, Geometric, Uniform, Exponential and Normal distributions.

TOTAL: 60 PERIODS

COURSE OUTCOMES:

At the end of the course the students will be able to

CO 1 Understand how to solve the given standard partial differential equations.

CO 2 Understand Fourier series analysis which plays a vital role in engineering applications.

CO 3 Understand the mathematical principles on Fourier transforms and provide them the ability to formulate and solve some of the physical problems of engineering.

CO 4 Use the effective mathematical tools for the solutions of difference equations by using Z transform techniques for discrete time systems.

CO 5 Apply the fundamental knowledge of the concepts of probability and one dimensional random variables

CO 6 Analyze standard probability distributions which can describe real life phenomenon.

TEXT BOOKS:

1. Kreyszig.E, "Advanced Engineering Mathematics", John Wiley and Sons, 10th Edition, New Delhi, 2016.
2. Grewal.B.S., "Higher Engineering Mathematics", Khanna Publishers, New Delhi, 44th Edition, 2018.
3. P.Sivaramakrishna Das and C.Vijayakumari "A Text Book on TPDE" Pearson Publications

REFERENCE BOOKS:

1. P.Sivaramakrishna Das and C.Vijayakumari "A Text Book on Probability and Random variables " - Pearson Publications
2. Narayanan. S., Manicavachagom Pillay.T.K and Ramanaiah.G "Advanced Mathematics for Engineering Students", Vol. II & III, S.Viswanathan Publishers Pvt. Ltd, Chennai, 1998.
3. Ramana. B.V., "Higher Engineering Mathematics", McGraw Hill Education Pvt. Ltd, New Delhi, 2018.

COs	POs												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	3	3	3	-	-	-	-	-	-	-	-	-	-	-	2
2	3	3	3	-	-	-	-	-	-	-	-	-	-	-	2
3	2	2	2	-	-	-	-	-	-	-	-	-	-	-	2
4	3	3	3	-	-	-	-	-	-	-	-	-	-	-	2
5	2	2	2	-	-	-	-	-	-	-	-	-	-	-	2
6	3	3	2	-	-	-	-	-	-	-	-	-	-	-	2
Overall correlation	3	3	3	-	-	-	-	-	-	-	-	-	-	-	2

23EE301 DC MACHINES AND TRANSFORMERS

L	T	P	C
3	0	0	3

COURSE OBJECTIVES:

- To understand the concept of electromechanical energy conversion system.
- To identify the appropriate machine for a given application based on its characteristics.
- To identify the appropriate test to determine the performance parameters of a given machine.
- To familiarize with the procedure for parallel operation of generators and transformers.
- To deliberate the working of auto transformer and three phase transformers.

UNIT I ELECTROMECHANICAL ENERGY CONVERSION 9

Fundamentals of Magnetic circuits- Statically and dynamically induced EMF - Principle of electromechanical energy conversion forces and torque in magnetic field systems- energy balance in magnetic circuits- magnetic force- co-energy in singly excited and multi excited magnetic field system

UNIT II DC GENERATORS 9

Principle of operation, constructional details, armature windings and its types, EMF equation, wave shape of induced emf, armature reaction, demagnetizing and cross magnetizing Ampere turns, compensating winding, commutation, methods of improving commutation, interpoles, OCC and load characteristics of different types of DC Generators

UNIT III DC MOTORS 9

Principle of operation, significance of back emf, torque equations and power developed by armature, speed control of DC motors, starting methods of DC motors, load characteristics of DC motors, losses and efficiency in DC machine, condition for maximum efficiency. Testing of DC Machines: Brake test, Swinburne’s test, Hopkinson's test. Separation of core losses-applications of DC motors

UNIT IV SINGLE PHASE TRANSFORMER 10

Construction and principle of operation, equivalent circuit, phasor diagrams, testing - open circuit and short circuit tests, voltage regulation, losses and efficiency, back-to-back test, separation of core losses, parallel operation of single-phase transformers, applications of single-phase transformer

UNIT V AUTOTRANSFORMER AND THREE PHASE TRANSFORMER **8**

Construction and working of auto transformer, comparison with two winding transformers, applications of autotransformer. Three Phase Transformer- Construction, types of connections and their comparative features, Scott connection, applications of Scott connection

TOTAL: 45 PERIODS

COURSE OUTCOMES:

At the end of the course the

CO1: Apply the laws governing the electromechanical energy conversion for singly and multiple excited systems.

CO2: Explain the construction, principle, and working of transformers, DC motors, and DC generator.

CO3: Illustrate various characteristics of DC machines.

CO4: Compute the performance parameters of DC motors using retardation, Swinburne's and Hopkinson's tests.

CO5: Compute the performance parameters of the transformer using Sumpner's test, OC, and SC test.

CO6: Compute the copper saving of autotransformers with respect to two winding transformers, and explain the three-phase transformers with different types of connections.

TEXT BOOKS:

1. I. J. Nagrath and D. P. Kothari, "Electric Machines", McGraw Hill Education, 5th Edition, 2017.
2. P. S. Bimbhra, "Electric Machinery", Khanna Publishers, 2nd Edition, 2021.

REFERENCE BOOKS:

1. A. E. Fitzgerald and C. Kingsley, "Electric Machinery", New York, McGraw Hill Education, 6th Edition 2017.
2. A. E. Clayton and N. N. Hancock, "Performance and design of DC machines", CBS Publishers,2018.
3. M. G. Say, "Performance and design of AC machines", CBS Publishers, First Edition 2008.
4. Sahdev S. K. "Electrical Machines", Cambridge University Press, 2018.

COs	POs												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	3	2	1	-	-	-	-	-	-	-	-	-	2	-	-
2	3	2	1	-	-	-	-	-	-	-	-	-	3	-	-
3	3	2	1	-	-	-	-	-	-	-	-	-	3	-	-
4	3	2	1	-	-	-	-	-	-	-	-	-	3	-	-
5	3	2	1	-	-	-	-	-	-	-	-	-	3	-	-
6	3	2	1	-	-	-	-	-	-	-	-	-	3	-	-
Overall correlation	3	2	1	-	-	-	-	-	-	-	-	-	3	-	-

23EE302	ELECTRONIC DEVICES AND INTEGRATED CIRCUITS	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To expose to active and passive circuit elements.
- To familiarize the operation and applications of transistor like BJT and FET.
- To analyze the characteristics of amplifier gain and frequency response.
- To comprehend the essential operations of positive and negative feedback systems and oscillators
- To develop Signal analysis using Op-amp based circuits.
- To familiarize the operation and Applications of Op-amp.
- To analyze the characteristics of applications of special ICs like Timers, PLL circuits, regulator.

UNIT I PN JUNCTION DIODES AND TRANSISTORS 9

PN junction diode – V-I characteristics, ratings and types – Clipping & Clamping circuits - Rectifiers – Half Wave and Full Wave Rectifier– BJT, IGBT- structure, operation, characteristics and Biasing.

UNIT II AMPLIFIERS AND OSCILLATORS 9

BJT small signal model – Analysis of CE, CB, CC amplifiers- Gain and frequency response –MOSFET small signal model– Analysis of CS and Source follower – Gain and frequency response - High frequency analysis, power amplifiers –Types (Qualitative analysis). Advantages of negative feedback – voltage / current, series, Shunt feedback –positive feedback – Condition for oscillations, phase shift – Wien bridge and Crystal oscillators.

UNIT III OP AMP & ITS APPLICATIONS 9

OPAMP– definition, block diagram, operation, characteristics, applications, µA 741 pin diagram. CMRR and Slew rate. OPAMP applications– inverting, integrator, differentiator, summer, voltage follower, and comparator. Filters- definition, Working- low pass, high pass active filters, applications

UNIT IV SPECIAL ICs 10

Functional block, characteristics of 555 Timer and its PWM application - IC-566 voltage controlled oscillator IC; 565-phase locked loop IC.

UNIT V APPLICATION ICs **8**

AD623 Instrumentation Amplifier and its application as load cell weight measurement - IC voltage regulators –LM78XX, LM79XX; Fixed voltage regulators its application as Linear power supply - LM 723 Variability voltage regulators, switching regulator- SMPS - ICL 8038 function generator IC.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

At the end of the course the

CO 1 Interpret the structure, operation, Applications and characteristics of Diodes and Transistors

CO 2 Analyze the performance of various configurations of BJT and MOSFET based amplifier.

CO 3 Examine the phase shift mechanisms in oscillator circuits and describe the different feedback arrangements seen in amplifiers.

CO 4 Implement operational amplifiers (OP-AMPs) in various applications.

CO 5 Examine the applications of IC555 – in Astable mode and Monostable mode of operation.

CO 6 Apply integrated circuit (IC) voltage regulators and function generator ICs in practical applications.

TEXT BOOKS:

1. Mike Tooley, "Electronic Circuits Fundamentals and Applications", CRC Press, 2019.
2. David A. Bell, "Electronic devices and circuits", Oxford University higher education, 5th edition 2008.
3. Morris Mano. M, 'Digital Logic and Computer Design', Pearson India, 2017.

REFERENCE BOOKS:

1. Sedra and smith, "Microelectronic circuits",7th Edition., Oxford University Press, 2017.
2. Thomas L. Floyd, "Electronic devices" Conventional current version, Pearson prentice hall, 10th Edition, 2017.
3. Donald D. Givone, 'Digital Principles and Design', Tata McGraw Hill,1st Edition, 2003
4. Thomas L Floyd, 'Digital fundamentals', Pearson Education Limited, 11th Edition, 2018.

COs	POs												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	3	3	1	1	1	-	-	-	-	-	-	-	3	-	-
2	3	3	1	1	1	-	-	-	-	-	-	-	3	-	-
3	2	3	1	1	1	-	-	-	-	-	-	-	3	-	-
4	3	3	1	1	1	-	-	-	-	-	-	-	3	-	-
5	3	3	1	1	1	-	-	-	-	-	-	-	3	-	-
6	3	3	1	1	1								3		
Overall correlation	3	3	1	1	1	-	-	-	-	-	-	-	3	-	-

23EE303 ELECTROMAGNETIC THEORY

L	T	P	C
3	0	0	3

COURSE OBJECTIVES:

- To introduce the basic mathematical concepts related to electromagnetic vector fields
- To impart knowledge on the concepts of Electrostatic fields, electric potential, energy density and their applications.
- To impart knowledge on the concepts of Magneto static fields, magnetic flux density, vector potential and its applications.
- To impart knowledge on the concepts of Different methods of emf generation and Maxwell's equations
- To impart knowledge on the concepts of Electromagnetic waves and characterizing parameters

UNIT I ELECTROSTATICS – I 9

Sources and effects of electromagnetic fields – Coordinate Systems – Vector fields – Gradient, Divergence, Curl – theorems and applications - Coulomb's Law – Electric field intensity – Field due to discrete and continuous charges – Gauss's law and applications.

UNIT II ELECTROSTATICS – II 9

Electric potential – Electric field and equipotential plots, Uniform and Non-Uniform field, Utilizationfactor – Electric field in free space, conductors, dielectrics - Boundary conditions, Poisson's and Laplace's equations, Applications

UNIT III MAGNETOSTATICS 9

Lorentz force, magnetic field intensity (H) – Biot–Savart's Law - Ampere's Circuit Law – H due to straight conductors, circular loop, infinite sheet of current, Magnetic flux density (B) – B in free space, conductor, magnetic materials – Magnetization, Magnetic field in multiple media –Boundary conditions, scalar and vector potential, Poisson's Equation, Applications.

UNIT IV ELECTRODYNAMIC FIELDS 10

Magnetic Circuits - Faraday's law – Transformer and motional EMF – Displacement current -Maxwell's equations (differential and integral form) – Relation between field theory and circuit theory – Applications.

UNIT V ELECTROMAGNETIC WAVES 8

Electromagnetic wave generation and equations – Wave parameters; velocity, intrinsic impedance, propagation constant – Waves in free space, lossy and lossless dielectrics, conductors- skin depth -Poynting vector.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

At the end of the course the

- **CO 1** Apply Gradient, Divergence, and Curl operations on Electromagnetic vector fields
- **CO 2** Analyse electrostatic fields, electric potential, energy density along with their applications.
- **CO 3** Analyse magneto static fields, magnetic flux density, vector potential along with their applications
- **CO 4** Apply Maxwell's equations to Electromagnetic vector fields
- **CO 5** Solve electromagnetic wave equation to determine wave parameters
- **CO 6** Build Electromagnetic fields and apply them for design and analysis of electrical equipment and systems

TEXT BOOKS:

1. Mathew N. O. Sadiku, S.V. Kulkarni 'Principles of Electromagnetics', 6th Edition, Oxford University Press Inc. Asian edition, 2015.
2. William H. Hayt and John A. Buck, 'Engineering Electromagnetics', McGraw Hill Special Indian edition, 2014.

REFERENCE BOOKS:

1. J.P.Tewari, 'Engineering Electromagnetics - Theory, Problems and Applications', Second Edition, Khanna Publishers 2013.
2. Joseph. A.Edminister, 'Schaum's Outline of Electromagnetics, Fifth Edition (Schaum's Outline Series), McGraw Hill, 2018.
3. S.P.Ghosh, Lipika Datta, 'Electromagnetic Field Theory', First Edition, McGraw Hill Education(India) Private Limited, 2017.
4. K A Gangadhar, 'Electromagnetic Field Theory', Khanna Publishers; Sixteenth Edition Eight Reprint :2015

COs	POs												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	3	3	3	2	-	-	-	2	-	-	-	-	-		-
2	3	3	3	2	-	-	-	2	-	-	-	-	3		3
3	3	3	3	2	-	-	-	2	-	-	-	-	3		3
4	3	3	3	2	-	-	-	2	-	-	-	-	3		3
5	3	3	3	2	-	-	-	2	-	-	-	-	3		3
6	3	3	3	2	-	-	-	2	-	-	-	-	3		3
Overall correlation	3	3	3	2	-	-	-	2	-	-	-	-	3		3

23HS301 UNIVERSAL HUMAN VALUES AND ETHICS

	L	T	P	C
	3	0	0	3

COURSE OBJECTIVES:

- Development of a holistic perspective based on self-exploration about themselves (human being), family, society and nature/existence.
- Understanding (or developing clarity) of the harmony in the human being, family, society and nature/existence.
- Strengthening of self-reflection.
- Development of commitment and courage to act.

UNIT I COURSE INTRODUCTION 9

Need, Basic Guidelines, Content and Process for Value Education - Understanding the need, basic guidelines, content and process for Value Education -Self Exploration–what is it? - its content and process; 'Natural Acceptance' and Experiential Validation- as the mechanism for self exploration - Continuous Happiness and Prosperity- A look at basic Human Aspirations -Right understanding, Relationship and Physical Facilities- the basic requirements for fulfilment of aspirations of every human being with their correct priority -Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario -Method to fulfil the above human aspirations: understanding and living in harmony at various levels.

UNIT II UNDERSTANDING HARMONY IN THE HUMAN BEING 9

Harmony in Myself- Understanding human being as a co-existence of the sentient 'I' and the material 'Body' -Understanding the needs of Self ('I') and 'Body' - Sukh and Suvidha- Understanding the Body as an instrument of 'I' (I being the doer, seer and enjoyer) - Understanding the characteristics and activities of 'I' and harmony in 'I' -Understanding the harmony of I with the Body: Sanyam and Swasthya; correct appraisal of Physical needs, meaning of Prosperity.

UNIT III UNDERSTANDING HARMONY IN THE FAMILY AND SOCIETY 9

Harmony in Human-Human Relationship -Understanding Harmony in the family – the basic unit of human interaction -Understanding values in human-human relationship; meaning of Nyaya and program for its fulfilment to ensure satisfaction; Trust(Vishwas) and Respect as the foundational values of relationship -Understanding the meaning of Vishwas; Difference between intention and competence -Understanding the meaning of Samman, Difference between respect and differentiation; the other salient values in relationship -Understanding the harmony in the society (society being an extension of family)-Visualizing a universal harmonious order in society- Undivided Society (Akhand Samaj), Universal Order- from family to world family.

UNIT IV ENGINEERING ETHICS 9

Senses of ‗Engineering Ethics„ – Variety of moral issues – Types of inquiry – Moral dilemmas – Moral Autonomy – Kohlberg's theory – Gilligan's theory – Consensus and Controversy – Models of professional roles - Theories about right action – Self-interest – Customs and Religion – Uses of Ethical Theories.

UNIT V SAFETY, RESPONSIBILITY AND RIGHTS 9

Safety and Risk – Assessment of Safety and Risk – Risk Benefit Analysis and Reducing Risk - Respect for Authority – Collective Bargaining – Confidentiality – Conflicts of Interest – Occupational Crime – Professional Rights – Employee Rights – Intellectual Property Rights (IPR) – Discrimination-Moral Leadership –Code of Conduct – Corporate Social Responsibility.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

At the end of the course the students will be able to

CO1: Understand the need of value education.

CO2: Comprehend the difference between self and body.

CO3: Understand the need to exist as an unit of Family and society.

CO4: Understand Harmony at all levels.

CO5: Apply the values acquired in the professional front.

CO6: Identify appropriate technologies for ecofriendly production systems.

TEXT BOOKS:

1. Human Values and Professional Ethics by R R Gaur, R Sangal, G P Bagaria, Excel Books, New Delhi, 2010 3.
2. Mike W. Martin and Roland Schinzinger, ―Ethics in Engineering‖, Tata McGraw Hill, New Delhi, 2003.
3. Govindarajan M, Natarajan S, Senthil Kumar V. S, ―Engineering Ethics‖, Prentice Hall of India, New Delhi, 2004

REFERENCE BOOKS:

1. Jeevan Vidya: Ek Parichaya, A Nagaraj, Jeevan Vidya Prakashan, Amarkantak, 1999.
2. Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004.
3. The Story of Stuff (Book).
4. The Story of My Experiments with Truth - by Mohandas Karamchand Gandhi AICTE Model Curriculum in Humanities, Social Science and Management Courses (UG Engineering & Technology) 169 | Page .
5. Small is Beautiful - E. F Schumacher.
6. Slow is Beautiful - Cecile Andrews.
7. Economy of Permanence - J C Kumarappa 8. Bharat Mein Angreji Raj – Pandit Sunderlal.

8. Rediscovering India - by Dharampal.
9. Hind Swaraj or Indian Home Rule - by Mohandas K. Gandhi .
10. India Wins Freedom - Maulana Abdul Kalam Azad.
11. Vivekananda - Romain Rolland (English) 13. Gandhi - Romain Rolland (English).
12. Charles B. Fleddermann, ―Engineering Ethics‖, Pearson Prentice Hall, New Jersey, 2004.
13. Charles E. Harris, Michael S. Pritchard and Michael J. Rabins, ―Engineering Ethics – Concepts and Cases‖, Cengage Learning, 2009.

WEB SOURCES:

1. www.onlineethics.org
2. www.nspe.org
3. www.globalethics.org

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO 1	-	-	-	-	-	3	3	3	3	3	-	-	-	-	3
CO 2	-	-	-	-	-	3	3	3	3	3	-	-	-	-	3
CO 3	-	-	-	-	-	3	3	3	3	3	-	-	-	-	3
CO 4	-	-	-	-	-	3	3	3	3	3	-	-	-	-	3
CO 5	-	-	-	-	-	3	3	3	3	3	-	-	-	-	3
CO 6	-	-	-	-	-	3	3	3	3	3	-	-	-	-	3
Overall correlation	-	-	-	-	-	3	3	3	3	3	-	-	-	-	3

23CS381 C PROGRAMMING AND DATA STRUCTURES

L	T	P	C
3	0	2	4

COURSE OBJECTIVES:

- To introduce the basics of C programming language.
- To learn the concepts of advanced features of C.
- To understand the concepts of ADTs and linear data structures.
- To know the concepts of non-linear data structure and hashing.
- To familiarize the concepts of sorting and searching techniques.

UNIT I C PROGRAMMING FUNDAMENTALS 6

Data Types – Variables – Operations – Expressions and Statements – Conditional Statements –Functions – Recursive Functions – Arrays – Single and Multi-Dimensional Arrays.

UNIT II C PROGRAMMING – ADVANCED FEATURES 6

Structures – Union – Enumerated Data Types – Pointers: Pointers to Variables, Arrays and Functions– File Handling – Preprocessor Directives.

UNIT III LINEAR DATA STRUCTURES 6

Abstract Data Types (ADTs) – List ADT – Array-Based Implementation – Linked List – Doubly- Linked Lists – Circular Linked List – Stack ADT – Implementation of Stack – Applications – Queue ADT –Priority Queues – Queue Implementation – Applications.

UNIT IV NON-LINEAR DATA STRUCTURES 6

Trees – Binary Trees – Tree Traversals – Expression Trees – Binary Search Tree – Hashing – Hash Functions – Separate Chaining – Open Addressing – Linear Probing– Quadratic Probing – Double Hashing – Rehashing.

UNIT V SORTING AND SEARCHING TECHNIQUES 6

Insertion Sort – Quick Sort – Heap Sort – Merge Sort –Linear Search – Binary Search.

TOTAL: 30 PERIODS

LIST OF EXPERIMENTS :

1. Practice of C programming using statements, expressions, decision making and Iterative statements
2. Practice of C programming using Functions and Arrays
3. Implement C programs using Files
4. Development of real time C applications
5. Array implementation of List ADT
6. Array implementation of Stack and Queue ADTs
7. Applications of List, Stack and Queue ADTs
8. Implementation of Binary Search Trees
9. Implementation of searching techniques
10. Implementation of Sorting algorithms : Insertion Sort, Quick Sort, Merge Sort

TOTAL: 30 +30 =60 PERIODS

TEXT BOOKS:

1. Mark Allen Weiss, "Data Structures and Algorithm Analysis in C", Second Edition, Pearson Education, 1997.
2. Reema Thareja, "Programming in C", Second Edition, Oxford University Press, 2016.

REFERENCE BOOKS:

1. Brian W. Kernighan, Rob Pike, "The Practice of Programming", Pearson Education, 1999.
2. Paul J. Deitel, Harvey Deitel, "C How to Program", Seventh Edition, Pearson Education, 2013.
3. Alfred V. Aho, John E. Hopcroft, Jeffrey D. Ullman, "Data Structures and Algorithms", Pearson Education, 1983.
4. Ellis Horowitz, SartajSahni and Susan Anderson, "Fundamentals of Data Structures", Galgotia,2008.

23EE321	**DC MACHINES AND TRANSFORMERS LABORATORY**	**L**	**T**	**P**	**C**
		0	**0**	**4**	**2**

COURSE OBJECTIVES:

- To expose the students to determine the characteristics of DC machines and transformers by performing experiments on these machines.
- To provide hands on experience to evaluate the performance parameters of DC machines and transformer by conducting suitable tests.

LIST OF EXPERIMENTS

1. Open circuit and load characteristics of DC shunt generator- calculation of critical resistance and critical speed.
2. Load characteristics of DC compound generator with differential and cumulative connections.
3. Load test on DC shunt motor.
4. Load test on DC compound motor.
5. Load test on DC series motor.
6. Swinburne's test and speed control of DC shunt motor.
7. Hopkinson's test on DC motor – generator set.
8. Load test on single-phase transformer and three phase transformers.
9. Open circuit and short circuit tests on single phase transformer.
10. Sumpner's test on single phase transformers.
11. Separation of no-load losses in single phase transformer.
12. Study of starters and 3-phase transformers connections.

TOTAL: 60 PERIODS

COURSE OUTCOMES:

At the end of the course the students will be able to

CO 1 Construct the circuit with appropriate connections for the given DC machine/transformer

CO 2 Determine the characteristics of different types of DC machines.

CO 3 Demonstrate the speed control techniques for a DC motor for industrial applications.

CO 4 Identify suitable methods for testing of transformer and DC machines

CO 5 Predetermine the performance parameters of transformers and DC motor.

CO 6 Identify DC motor starters and 3-phase transformer connections.

COs	POs												PSOs		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
1	3	3	1	1	-	-	-	-	1	-	-	-	1		-
2	3	3	1	1	-	-	-	-	1	-	-	-	1		-
3	3	3	1	1	-	-	-	-	1	-	-	-	1		-
4	3	3	1	1	-	-	-	-	1	-	-	-	1		-
5	3	3	1	1	-	-	-	-	1	-	-	-	1		-
6	3	3	1	1	-	-	-	-	1	-	-	-	1		-
Overall correlation	3	3	1	1	-	-	-	-	1	-	-	-	1		-

23EE322	ELECTRONIC DEVICES AND INTEGRATED CIRCUITS LABORATORY	L	T	P	C
		0	0	4	2

COURSE OBJECTIVES:

- To enable the students to understand the behavior of semiconductor device based on experimentation.
- To familiarize the operation and characteristics of transistor like BJT and FET.
- To explore the characteristics of amplifier gain and frequency response.
- To learn design, testing and characterizing of Oscillator circuits.
- To familiarize the operation of CRO for Measurements.
- To learn design, testing the application circuits of Op Amp, timer and Voltage regulator ICs.

LIST OF EXPERIMENTS

1. Characteristics of Semiconductor diode, Zener diode, photo diode, and photo transistor.
2. Characteristics of NPN Transistor under common emitter, common collector and common base configurations
3. Characteristics of JFET and draw the equivalent circuit
4. Design and testing of RC phase shift and LC oscillators
5. Measurement of frequency and phase angle using CRO
6. Realization of passive filters
7. Application of Op-Amp: Inverting & Non-Inverting Amplifier,
8. Application of Op-Amp: Adder and Comparator
9. Application of Op-Amp: Differentiator & Integrator
10. Variability Voltage Regulator using IC LM317.
11. Timer NE/SE 555 IC applications - Astable Multivibrator
12. Timer NE/SE 555 IC applications - Monostable Multivibrator.

TOTAL: 60 PERIODS

COURSE OUTCOMES:

At the end of the course the students will be able to

CO 1 Analyze semiconductor device characteristics and their applications, including diodes, Zener diodes, photodiodes, and phototransistors.

CO 2 Evaluate the behaviour of NPN transistor and JFET from their characteristics.

CO 3 Design and verify the performance of phase shift oscillators and passive filters.

CO 4 Demonstrate proficiency in designing and implementing Op-Amp-based application circuits.

CO 5 Design and implement a variable voltage regulator using the LM317 integrated circuit, ensuring stable output under varying load conditions.

CO 6 Explore applications of NE/SE 555 timers by constructing Astable Multivibrator and monostable multivibrator circuits for signal generation and timing applications.

COs	POs												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	3	3	1	2	-	-	-	-	1	-	-	-	1		-
2	3	3	1	2	-	-	-	-	1	-	-	-	1		-
3	3	3	1	2	-	-	-	-	1	-	-	-	1		-
4	3	3	1	2	-	-	-	-	1	-	-	-	1		-
5	3	3	1	2	-	-	-	-	1	-	-	-	1		-
6	3	3	1	2	-	-	-	-	1	-	-	-	1		-
Overall correlation	3	3	1	2	-	-	-	-	1	-	-	-	1		-

23ES391 PRESENTATION SKILLS

	L	T	P	C
	0	0	2	1

COURSE OBJECTIVES:

- To help learners use brainstorming techniques for generating, organizing and outlining ideas.
- To familiarize learners with different speech structures by engaging them in watching speeches with great opening and closing
- To give practice on voice modulation and use of body language and eye contact for making captivating presentations
- To give hands on training on preparing presentation slides and using remote presentation tools
- To train students on responding to question and feedback with confidence.

UNIT I BRAINSTORMING AND OUTLINING 6

Mind Mapping based on prior knowledge, collecting additional information from external resources, giving prompts to Generative AI tools seeking information, organizing ideas generated, knowing your audience

UNIT II STRUCTURING THE PRESENTATION 6

3 Ts of a presentation, writing effective introduction- Beginning the introduction with a hook (question, data, storytelling) and closing the introduction with the objective of the presentation. Structuring the body paragraphs -Choosing key ideas from the list of ideas generated during brainstorming. Substantiating ideas with examples, data, reasons and anecdotes. Summarizing the ideas for conclusion.

UNIT III DELIVERY TECHNIQUES 6

Vocal variety, intonation, reducing filler words and improving articulation, inflection, engaging the audience. Body language- eye contact, gestures, movement on stage.

UNIT IV USE OF TECHNOLOGICAL AIDS 6

Use of presentation software like MS Power Point, Google Slides etc, incorporating images, graphs, charts and videos, using interactive tools like quizzes and polls, using remote presentation tools like zoom, MS Teams, WebEx for screen sharing, virtual whiteboards and chat functionalities, incorporating AR/VR for more immersive presentations .

UNIT V HANDLING QUESTIONS AND FEEDBACK 6

Audience engagement through questions, PAR (Point, Answer, Redirect) strategy for structuring responses to questions. Understanding feedback process - Receiving, interpreting and evaluating constructively, active listening techniques for processing feedback, responding to feedback- acknowledging, clarifying and appreciating, Dealing with challenging feedback.

TOTAL: 30 PERIODS

COURSE OUTCOMES:

After completion of the course, the students should be able to

CO1 construct ideas for presentation through mind mapping techniques

CO2 organize ideas and structure the presentation with captivating introduction, body paragraphs illustrated with examples and reasons and compelling conclusion

CO3 apply vocal variety and body language techniques to enhance delivery

CO4 prepare engaging presentations by integrating multimedia elements

CO5 demonstrate proficiency in delivering presentations in remote platforms utilizing various technological tools and strategies to engage audience in virtual environments

CO6 exhibit active listening skills by responding to questions with clarity and confidence and incorporating constructive feedback for professional development

TEXT BOOKS:

1. "Slide:ology: The Art and Science of Creating Great Presentations" by Nancy Duarte. O'Reilly Media
2. "The Naked Presenter: Delivering Powerful Presentations With or Without Slides" by Garr Reynolds. New Riders

REFERENCE BOOK:

Talk Like TED: The 9 Public-Speaking Secrets of the World's Top Minds" by Carmine Gallo.

23MA403 NUMERICAL AND STATISTICAL METHODS

L	T	P	C
3	1	0	4

COURSE OBJECTIVES:

- To provide the necessary basic concepts of a few statistical and numerical methods and give procedures for solving numerically different kinds of problems occurring in engineering and technology.
- To acquaint the knowledge of testing of hypothesis for small and large samples which plays an important role in real life problems
- To introduce the basic concepts of solving algebraic and transcendental equations.
- To introduce the numerical techniques of interpolation in various intervals and numerical techniques of differentiation and integration which plays an importantrole in engineering and technology
- To acquaint the knowledge of various techniques and methods of solving ordinary differential equations.

UNIT I TESTING OF HYPOTHESIS 9+3

Sampling distributions – Standard error - Large sample test for single mean, proportion, difference of means – Small sample Tests– t Test for single mean and difference of means - F test for equality of variance – Chi square test for single variance- Independence of attribute-Goodness of fit (Binomial Distribution, PoissonDistribution).

UNIT II DESIGN OF EXPERIMENTS 9+3

One way and two way classifications - Completely randomized design – Randomized block design – Latin square design

UNIT III SOLUTION OF EQUATIONS AND EIGENVALUE PROBLEMS 9+3

Solution of algebraic and transcendental equations - Fixed point iteration method – Newton Raphson method- Solution of linear system of equations - Gauss elimination method – Pivoting - Gauss Jordan method – Iterative methods of GaussJacobi and Gauss Seidel - Eigenvalues of a square matrix by Power method

UNIT IV INTERPOLATION, NUMERICAL DIFFERENTIATION AND NUMERICAL INTEGRATION 9+3

Interpolation - Newton‘s forward and backward difference interpolation -Lagrange‘s and Newton‘s divided difference interpolations –– Approximation of derivative using interpolation polynomials – Numerical single integration and double integrations using Trapezoidal and Simpson‘s 1/3rules.

UNIT V NUMERICAL SOLUTION OF ORDINARY DIFFERENTIAL EQUATIONS **9+3**

Single step methods: Taylor's series method - Euler's method - Modified Euler's method - Fourth order Runge-Kutta method for solving first order differential equations - Multi step methods: Milne's and Adam's Bashforth method.

TOTAL: 60 PERIODS

COURSE OUTCOMES:

At the end of the course the students will be able to

CO1: Analyze the given data for large and small samples.

CO2: Analyze the problems involving design of experiments.

CO3: Determine numerical solutions for nonlinear (algebraic or transcendental) equations, large system of linear equations and Eigen value problem of a matrix, when analytical methods fail to give solution.

CO4: Distinguish the Newton's forward, backward, divided difference, Lagrange's in finding the intermediate values of the experimental data and solving the problems using numerical differentiation and integration.

CO5: Solve numerically, ordinary differential equations which is used to solve different kinds of problems occurring in engineering and technology.

TEXT BOOKS:

1. Grewal, B.S., and Grewal, J.S., "Numerical Methods in Engineering and Science", Khanna Publishers, 10th Edition, New Delhi, 2015.
2. Johnson, R.A., Miller, I and Freund J., ―Miller and Freund's Probability and Statistics for Engineers", Pearson Education, Asia, 8th Edition,2015.

REFERENCE BOOKS:

1. Dr.P.Sivaramakrishnadas, Dr. C.Vijayakumari, ―Statistics and Numerical Methods‖ Pearson Publications.
2. Burden, R.L and Faires,J.D,"Numerical Analysis‖, 9th Edition, Cengage Learning,2016.
3. Devore.J.L.‖Probability and Statistics for Engineering and the Sciences‖, Cengage Learning, NewDelhi, 8th Edition,2014.
4. Gerald.C.F. and Wheatley.P.O. "Applied Numerical Analysis‖ Pearson Education, Asia, New Delhi, 7th Edition, 2007.

CO Nos.	POs												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	3	2	1	1	-	-	-	-	-	-	-	1	3	-	-
2	3	2	1	1	-	-	-	-	-	-	-	1	3	-	-
3	3	2	1	1	-	-	-	-	-	-	-	1	3	-	-
4	3	2	1	1	-	-	-	-	-	-	-	1	3	-	-
5	3	2	1	1	-	-	-	-	-	-	-	1	3	-	-
Overall correlation	3	2	1	1	-	-	-	-	-	-	-	1	3	-	-

23EE401 INDUCTION AND SYNCHRONOUS MACHINES

L	T	P	C
3	0	0	3

COURSE OBJECTIVES:

To impart knowledge on

- Construction and performance of salient and non – salient type synchronous generators.
- Principles of operation and performance of synchronous motor.
- Construction, principle of operation and performance of induction machines.
- Starting and speed control of three-phase induction motors.
- Construction, principle of operation and performance of single phase induction motors and special machines.

UNIT I SYNCHRONOUS GENERATOR 9

Constructional details – Types of rotors –winding factors- EMF equation – Synchronous reactance –Armature reaction – Phasor diagrams of non-salient pole synchronous generator connected to infinite bus- Synchronizing torque -Change of excitation and mechanical input- Voltage regulation – EMF, MMF, and ZPF methods –Two reaction theory –slip test.

UNIT II SYNCHRONOUS MOTOR 9

Principle of operation – Torque equation – Operation on infinite bus bars - V and Inverted V curves –Power input and power developed equations – Starting methods – Current loci for constant power input, constant excitation and constant power Developed-Hunting – natural frequency of oscillations –damper windings- synchronous condenser.

UNIT III THREE PHASE INDUCTION MOTOR 9

Constructional details – Types of rotors –- Principle of operation – Slip –cogging and crawling- Equivalent circuit – Torque-Slip characteristics - Condition for maximum torque – Losses and efficiency – Load test - No load and blocked rotor tests - Circle diagram – Separation of losses –Double cage induction motors –Induction generators – Synchronous induction motor

UNIT IV STARTING AND SPEED CONTROL OF THREE PHASE INDUCTION MOTOR 9

Need for starting – Types of starters – DOL, Rotor resistance, Autotransformer and Star delta starters – Speed control – Voltage control, Frequency control and pole changing – Cascaded Connection-V/f control – Slip power recovery Scheme-Braking of three phase induction motor: Plugging, dynamic braking and regenerative braking

UNIT V SINGLE PHASE INDUCTION MOTORS 9

Constructional details of single phase induction motor – Double field revolving theory and operation –Equivalent circuit – No load and blocked rotor test – Performance analysis – Starting methods of single-phase induction motors – Capacitor-start capacitor run Induction motor- Shaded pole induction motor - Linear induction.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

At the end of the course the students will be able to

CO 1 Compute the regulation of alternator using EMF, MMF, ZPF and ASA method and slip test.

CO 2 Explain the construction, working and performance of synchronous motor

CO 3 Explain the construction and working principle of Three Phase Induction Motor

CO 4 Explain the Explain the different methods of starting, speed control of three phase induction motor

CO 5 Illustrate the construction and working of single phase induction motor and special electrical machines

CO 6 Investigate the performance parameters of synchronous motor, single phase and three phase induction motor.

TEXT BOOKS:

1. A.E. Fitzgerald, Charles Kingsley, Stephen. D.Umans, 'Electric Machinery', Tata McGraw Hill publishing Company Ltd, 2003.
2. Stephen J. Chapman, 'Electric Machinery Fundamentals'4th edition, McGraw Hill Education Pvt. Ltd, 4th Edition 2017.
3. D.P. Kothari and I.J. Nagrath, 'Electric Machines', Tata McGraw Hill Publishing Company Ltd, 2002.
4. P.S. Bhimbhra, 'Electrical Machinery', Khanna Publishers, 2003.

REFERENCE BOOKS:

1. Vincent Del Toro, 'Basic Electric Machines' Pearson India Education, 2016
2. M.N.Bandyopadhyay, Electrical Machines Theory and Practice, PHI Learning PVT LTD., New Delhi, 2009.
3. B.R.Gupta, 'Fundamental of Electric Machines' New age International Publishers,3rd Edition, Reprint 2015.
4. K. Murugesh Kumar, 'Electric Machines', Vikas Publishing House Pvt. Ltd, 2002
5. Alexander S. Langsdorf, Theory of Alternating-Current Machinery, Tata McGraw Hill Publications, 2001.

COs	POs												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	3	2	1	1	1	-	-	-	-	1	1	1	3	2	-
2	3	2	1	1	2	-	-	-	-	1	1	1	3	2	-
3	3	3	2	-	2	-	-	-	-	1	1	2	3	1	-
4	3	2	1	1	2	-	-	-	-	1	1	1	3	1	-
5	3	2	1	1	2	-	-	-	-	1	1	1	3	2	-
6	3	3	2	-	2	1	1	2	-	1	1	2	1	2	2
Overall correlation	3	3	2	1	2	1	1	2	-	1	1	2	3	2	2

23EE402	MICROPROCESSOR AND MICROCONTROLLER SYSTEMS	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To study the addressing modes & instruction set of 8085 &8051
- To develop skills in simple program writing in assembly languages
- To introduce commonly used peripheral/interfacing ICs.
- To study and understand typical applications of micro-processors.
- To study and understand the typical applications of micro-controllers

UNIT I INTRODUCTION TO CISC ARCHITECTURE 9

Functional block diagram – Memory interfacing–I/O ports and data transfer concepts – Timing Diagram – Interrupt structure

UNIT II CISC INSTRUCTION SET AND PROGRAMMING 9

Instruction format and addressing modes – Assembly language format – Data transfer, data manipulation & control instructions – Programming: Loop structure with counting & Indexing - Look up table - Subroutine instructions, stack.

UNIT III INTERFACING BASICS AND ICS 9

Study of Architecture and programming of ICs: 8255 PPI, 8259PIC, 8251USART, 8279 Keyboard display controller and 8254 Timer/Counter – Interfacing with 8085 -A/D and D/A converter interfacing.

UNIT IV INTRODUCTION TO MICROCONTROLLER 9

Functional block diagram - Instruction format and addressing modes – Interrupt structure – Timer – I/O ports – Serial communication, Simple programming –keyboard and display interface – Temperature control system –stepper motor control - Usage of IDE for assembly language programming.

UNIT V OVERVIEW OF RISC-BASED ARCHITECTURE 9

PIC16 /18 architecture, Memory organization – Addressing modes – Instruction set - Programming techniques – Timers – I/O ports – Interrupt programming.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

At the end of the course the students will be able to

CO 1 Explain the Architecture of Microprocessor 8085 and its Interrupt structure.

CO 2 Summarize the addressing modes & instruction set of 8085.

CO 3 Develop simple programming concepts for interfacing of 8085 with 8255: S259: 8254: 8279: and A/D &D/A converters interfacing with 8085 and 8051

CO 4 Explain the Architecture of Microcontroller 8051& its Interrupt structure.

CO 5 Classify different instruction sets used for 8051

CO 6 Develop simple programming exercise using PIC Microcontroller

TEXT BOOKS:

1. Ramesh S. Gaonkar, 'Microprocessor Architecture Programming and Application', Penram International (P)ltd., Mumbai, 6th Education, 2013.
2. Muhammad Ali Mazidi & Janice Gilli Mazidi, 'The 8051 Micro Controller and Embedded Systems', Pearson Education, Second Edition 2011.
3. Muhammad Ali Mazidi & Janice Gilli Mazidi, 'The PIC Micro Controller and Embedded Systems', 2010.

REFERENCE BOOKS:

1. Douglas V. Hall, "Micro-processors & Interfacing", Tata McGraw Hill 3rd Edition, 2017.
2. Krishna Kant, "Micro-processors & Micro-controllers", Prentice Hall of India, 2007.
3. Mike Predko, "8051 Micro-controllers", McGraw Hill, 2009
4. Kenneth Ayala, 'The 8051 Microcontroller', Thomson, 3rd Edition 2004.

COs	POs												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	3	3	1	1	-	-	-	-	1	-	-	-	3	-	-
2	3	3	1	1	-	-	-	-	1	-	-	-	3	-	-
3	3	3	1	1	-	-	-	-	1	-	-	-	3	-	-
4	3	3	1	1	-	-	-	-	1	-	-	-	2	-	-
5	3	3	1	1	-	-	-	-	1	-	-	-	2	-	-
6	3	3	1	1					1				2		
Overall correlation	**3**	**3**	**1**	**1**	-	-	-	-	**1**	-	-	-	**3**	-	-

23EE403 MEASUREMENTS AND INSTRUMENTATION

L	T	P	C
3	0	0	3

COURSE OBJECTIVES:

- To educate the fundamental concepts and characteristics of measurement and errors
- To impart the knowledge on the functional aspects of measuring instruments
- To infer the importance of various bridge circuits used with measuring instruments.
- To educate the fundamental working of sensors and transducers and their applications
- To summarize the overall measurement and instrumentation with the knowledge on digital instrumentation principles.

UNIT I CONCEPTS OF MEASUREMENTS 9

Instruments: classification, applications – Elements of a generalized measurement system - Static and dynamic characteristics - Errors in measurement -Statistical evaluation of measurement data.

UNIT II MEASUREMENT OF PARAMETERS IN ELECTRICAL SYSTEMS 9

Classification of instruments – moving coil and moving iron meters – Induction type, dynamometer type watt meters – Energy meter – Megger – Instrument transformers (CT & PT).

UNIT III AC/DC BRIDGES AND INSTRUMENTATION AMPLIFIERS 9

Wheatstone bridge, Kelvin double bridge - Maxwell, Hay, Wien and Schering bridges – Errors and compensation in A.C. bridges - Instrumentation Amplifiers

UNIT IV TRANSDUCERS FOR MEASUREMENT OF NON-ELECTRICAL PARAMETERS 9

Classification of transducers – Measurement of pressure, temperature, displacement, flow, angular velocity – Digital transducers – Smart Sensors.

UNIT V DIGITAL INSTRUMENTATION 9

A/D converters: types and characteristics – Sampling, Errors- Measurement of voltage, Current, frequency and phase - D/A converters: types and characteristics- DSO- Data Loggers – Basics of PLC programming and Introduction to Virtual Instrumentation - Instrument standards.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

At the end of the course the students will be able to

- **CO1:** Explain the functional elements of the Instrumentation system, its characteristics, Errors.
- **CO2:** Analyze the working principle of MC and MI Induction type, wattmeter, energy meter and the instruments used for resistance, instrument transformers CT & PT.
- **CO3:** Apply various measurement techniques in AC and DC Bridges, transformer ratio bridges and Instrument amplifiers.
- **CO4:** Infer transducer, smart sensor & digital transducer, Measurement of pressure, temperature, displacement, flow, angular velocity.
- **CO5:** Explain various types of A/D converter, D/A converter, sampling, Errors and measurement of voltage, current, frequency and phase.
- **CO6:** Outline DSO, Data loggers, PLC and virtual instrumentation.

TEXT BOOKS:

1. A.K. Sawhney, Puneet Sawhney 'A Course in Electrical & Electronic Measurements & Instrumentation', Dhanpat Rai and Co, New Delhi, Edition 2011.
2. H.S. Kalsi, 'Electronic Instrumentation', Tata McGraw-Hill, New Delhi, 2010

REFERENCE BOOKS:

1. M.M.S. Anand, 'Electronics Instruments and Instrumentation Technology', Prentice Hall India, New Delhi, 2009
2. J.J. Carr, 'Elements of Electronic Instrumentation and Measurement', Pearson Education India, New Delhi, 2011 87
3. W.Bolton, Programmable Logic Controllers, 6th Edition, Elseiver, 2015.
4. R.B. Northrop, 'Introduction to Instrumentation and Measurements', Taylor & Francis, New Delhi, 3 rd Edition 2014.
5. E. O. Doebelin and D. N. Manik, "Measurement Systems – Application and Design", Tata McGraw- Hill, New Delhi, 6th Edition 2017.
6. R. K. Rajput, "Electrical and Electronics Measurements and Instrumentation", Chand Pub, 2016

COs	**POs**												**PSOs**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
1	3	2	3	-	-	2	-	-	-	-	-	3	3	3	3
2	3	2	3	2	-	-	-	-	-	-	-	3	3	3	3
3	3	2	3	-	-	2	-	-	2	-	-	3	3	3	3
4	3	2	3	-	-	-	-	-	-	-	-	3	3	3	3
5	3	2	3	-	-	-	-	-	-	-	-	-	3	3	3
6	3	3	3	2	2	2	-	-	2	-	-	3	3	3	3
Overall correlation	3	2	3	2	2	2	-	-	2	-	-	3	3	3	3

23EE404 TRANSMISSION AND DISTRIBUTION **L T P C**
3 0 0 3

COURSE OBJECTIVES:

- To impart knowledge about the configuration of the electrical power systems.
- To study the line parameters and interference with neighbouring circuits.
- To understand the mechanical design and performance analysis of transmission lines.
- To learn about different insulators and underground cables.
- To understand and analyze the distribution system.

UNIT I TRANSMISSION LINE PARAMETERS 9

Structure of electric power system - Parameters of single and three phase transmission lines with single and double circuits - Resistance, inductance, and capacitance of solid, stranded, and bundled conductors - Typical configuration, conductor types - Symmetrical and unsymmetrical spacing and transposition – application of self and mutual GMD; skin and proximity effects - Effects of earth on the capacitance of the transmission line - interference with neighbouring communication circuits.

UNIT II MODELLING AND PERFORMANCE OF TRANSMISSION LINES 9

Performance of Transmission lines – short line, medium line and long line – equivalent circuits, phasor diagram, attenuation constant, phase constant, surge impedance – transmission efficiency and voltage regulation,– Ferranti effect – Formation of Corona – Critical Voltages – Effect on line Performance.

UNIT III SAG CALCULATION AND LINE SUPPORTS 9

Mechanical design of overhead lines – Line Supports –Types of towers – Tension and Sag Calculation for different weather conditions – Methods of grounding - Insulators: Types, voltage distribution in insulator string, improvement of string efficiency, testing of insulators.

UNIT IV UNDERGROUND CABLES 9

Underground cables – Types of cables – Construction of single-core and 3-core belted cables –Insulation Resistance – Potential Gradient – Capacitance of single-core–Grading of cables – Power factor and heating of cables– DC cables.

UNIT V DISTRIBUTION SYSTEMS 9

Distribution Systems – General Aspects – Kelvin's Law – AC and DC distributions – concentrated and Distributed loading- Power factor improvement – Distribution Loss – Types of Substations – Trends in Transmission and Distribution: EHVAC, HVDC and FACTS(Qualitative treatment only).

TOTAL: 45 PERIODS

COURSE OUTCOMES:

At the end of the course the students will be able to

CO1: Illustrate the structure of power system, transmission line parameters for different configurations and the impact of skin and proximity effects.

CO2: Develop the various models the transmission lines to determine the line performance and the impact of Ferranti effect and corona on line performance.

CO3: Analyse the Mechanical design of transmission lines and concept of grounding.

CO4: Compute the voltage distribution in insulator strings in transmission system

CO5: Examine the performance analysis of underground cable.

CO6: Discuss the modelling, performance analysis and modern trends in distribution system.

TEXT BOOKS:

1. D.P. Kothari, I. J. Nagarath, "Power System Engineering", Tata McGraw-Hill Publishing Company limited, New Delhi, Third Edition, 2019.
2. C. L. Wadhwa, "Electrical Power Systems", New Academic Science Ltd, Eighth Multicolor edition ,2022.

REFERENCE BOOKS:

1. J.B. Gupta. "Transmission & Distribution Of Electrical Power", S.K. Kataria & Sons, New Delhi, Fifth Edition, 2012.
2. V.K. Mehta, Rohit Mehta, "Principles of power system", S. Chand & Company Ltd, New Delhi, 2022
3. Hadi Saadat, "Power System Analysis", McGraw Hill Education Pvt. Ltd., New Delhi, 3rd Edition,23rd reprint, 2015.
4. R. K. Rajput, "A Text Book of Power System Engineering" 2nd edition, Laxmi Publications (P) Ltd, New Delhi, 2016.

COs	**POs**												**PSOs**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
1	2	1	-	-	-	1	1	2	-	3	-	3	2	-	2
2	3	3	2	1	-	1	1	3	-	3	-	2	3	-	3
3	3	3	2	1	-	1	1	3	-	3	-	2	3	-	3
4	3	2	1	1	-	1	1	3	-	3	-	2	3	-	3
5	3	2	-	-	-	1	1	2	-	3	-	3	2	-	2
6	2	1	1	1		1	1	3		3		3	3		3
Overall correlation	3	2	1	1	-	2	2	3	-	3	-	3	3	-	3

23EE411 DIGITAL LOGIC CIRCUITS

L	T	P	C
2	0	2	3

COURSE OBJECTIVES:

- To introduce the fundamentals of combinational and sequential digital circuit.
- To study various number systems and to simplify the mathematical
- expressions using Boolean functions word problems
- To study implementation of combinational circuits using Gates` and MSI Devices.
- To study the design of various synchronous and asynchronous circuits
- To introduce digital simulation techniques for development of application oriented logic circuit

UNIT I NUMBER SYSTEMS AND DIGITAL LOGIC FAMILIES 6

Number system, error detection, corrections & codes conversions, Boolean algebra: DeMorgan's theorem - Digital Logic Families -comparison of TTL and MOS families.

UNIT II COMBINATIONAL CIRCUITS 6

Combinational logic - representation of logic functions-SOP and POS forms, K-map representations - minimization using K maps - simplification and implementation of combinational logic – multiplexers and de multiplexers - code converters, adders, subtractors.

UNIT III SYNCHRONOUS SEQUENTIAL CIRCUITS 6

Sequential logic- SR, JK, D and T flip flops - level triggering and edge triggering - counters - asynchronous and synchronous type - Modulo counters. - design of synchronous sequential circuits – Moore and Melay models- Counters.

UNIT IV ASYNCHRONOUS SEQUENTIAL CIRCUITS AND PROGRAMMABILITY LOGIC DEVICES 6

Asynchronous sequential logic circuits-Transition stability, flow stability-race conditions, hazards & errors in digital circuits; introduction to Programmability Logic Devices: PROM – PLA –PAL, CPLD-FPGA.

UNIT V VHDL 6

RTL Design – combinational logic – Sequential circuit – Operators – Introduction to Packages – Subprograms –Tutorial Examples: adders, Counters, flip flops, Multiplexers & De multiplexers).

TOTAL: 30 PERIODS

LAB COMPONENT **30 PERIODS**

1. Implementation of Boolean Functions, Adder and Subtractor circuits.
2. Code converters: Excess-3 to BCD and Binary to Gray code converter and vice-versa.
3. Parity generator and parity checking.
4. Encoders and Decoders.
5. Counters: Design and implementation of 3-bit modulo counters as synchronous and Asynchronous types using FF IC's and specific counter IC.
6. Shift Registers: Design and implementation of 4-bit shift registers in SISO, SIPO, PISO, PIPO modes using suitability IC's.
7. Study of multiplexer and de multiplexer

COURSE OUTCOMES:

At the end of the course the students will be able to

CO 1 Apply the concepts of number systems to frame the binary codes

CO 2 Summarize the characteristics and operation of digital logic families TTL and MOS

CO 3 Apply the k map concepts to simplify the combinational logic circuits (multiplexers, demultiplexers, code converters, adders and subtractors, Encoders and Decoders)

CO 4 Design synchronous and asynchronous sequential circuit with state reduction.

CO 5 Apply the concepts of programmable logic devices like PROM, PAL, PLA, CPLD and FPGA for any given expression

CO 6 Develop coding for a given logic circuit using VHDL

TEXT BOOKS:

1. Morris Mano.M,' Digital Logic and Computer Design', Prentice Hall of India, 3rdEdition,2005.
2. Donald D.Givone,'Digital Principles and Design',TataMcGrawHill,1stEdition,2003
3. Thomas L Floyd, 'Digital fundamentals', Pearson Education Limited, 11th Edition, 2018.

REFERENCE BOOKS:

1.Tocci R.J., Neal S. Widmer, 'Digital Systems: Principles and Applications', Pearson Education Asia,2017. 12th Edition.

2.Donald P Leach, Albert Paul Malvino, Goutam 1Sha, 'Digital Principles and Applications', Tata McGraw Hill, 7th Edition, 2010.

COs	POs												PSOs		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
1	2	1	2	3	-	-	-	-	-	-	-	**3**	3	1	3
2	2	1	2	3	-	-	-	-	-	-	-	**2**	3	1	3
3	2	1	2	3	-	-	-	-	-	-	-	**2**	3	1	3
4	2	1	2	3	-	-	-	-	-	-	-	**2**	3	1	3
5	2	1	2	3	-	-	-	-	-	-	-	**3**	3	1	3
6	2	1	2	3	-	-	-	-	-	-	-	**3**	3	1	3
Overall correlation	**1**	**2**	**3**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**1**	**3**	**2**

23EE421	INDUCTION AND SYNCHRONOUS MACHINES LABORATORY	L	T	P	C
		0	0	4	2

COURSE OBJECTIVES:

- To expose the students to the operation of synchronous machines and induction motors and give them experimental skill.

LIST OF EXPERIMENTS :

1. Regulation of three phase alternator by EMF and MMF methods.
2. Regulation of three phase alternator by ZPF method.
3. Regulation of three phase salient pole alternator by slip test.
4. Measurements of negative sequence and zero sequence impedance of alternators.
5. V and Inverted V curves of Three Phase Synchronous Motor.
6. Load test on three-phase induction motor.
7. No load and blocked rotor tests on three-phase induction motor (Determination of equivalent circuit parameters).
8. Separation of No-load losses of three-phase induction motor.
9. Load test on single-phase induction motor.
10. No load and blocked rotor test on single-phase induction motor.
11. Study of Induction Motor Starters

TOTAL : 60 PERIODS

COURSE OUTCOMES:

At the end of the course the students will be able to

CO 1 Analyze EMF, MMF and ZPF methods of voltage regulation of alternative

CO 2 Analyze the characteristics of V and Inverted V curves for synchronous motor.

CO 3 Experiment various tests on alternator and obtain their performance indices using standard analytical as well as graphical methods.

CO 4 Experiment various tests on 3 phase induction motor and obtain their performance indices using standard analytical as well as graphical methods.

CO 5 Experiment various tests on single phase induction motor and obtain their performance indices using standard analytical as well as graphical methods.

CO 6 Apply knowledge on separation of losses of Induction machines.

COs	POs												PSOs		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
1	3	3	3	2	2	1	1	2	3	3	2	2	3	2	2
2	3	3	3	1	2	1	1	2	3	3	2	2	3	2	2
3	3	3	2	2	2	1	1	1	3	3	1	1	3	2	2
4	3	3	2	1	1	1	2	2	3	3	2	1	3	2	2
5	3	3	2	1	1	1	1	2	2	2	2	2	3	1	2
6	3	3	2	1	1	1	1	2	2	2	2	2	3	1	2
Overall correlation	3	3	2	1	1	1	1	2	3	3	2	2	3	2	2

		L	T	P	C
23EE422	**MICROPROCESSOR AND MICROCONTROLLER SYSTEMS LABORATORY**	**0**	**0**	**4**	**2**

COURSE OBJECTIVES:

- To perform simple arithmetic operations using assembly language program and study the
- addressing modes & instruction set of 8085 & 8051
- To develop skills in simple program writing in assembly languages
- To write an assembly language program to convert Analog input to Digital output and Digital
- input to Analog output.
- To perform interfacing experiments with µP8085
- To perform interfacing experiments with µC8051.

LIST OF EXPERIMENTS :

1. Simple arithmetic operations: Multi precision addition / subtraction /multiplication / division.
2. Programming with control instructions: Increment / Decrement, Ascending / Descending order, Maximum / Minimum of numbers, Rotate instructions, Hex / ASCII / BCD code conversions.
3. Interface Experiments: A/D Interfacing. D/A Interfacing. Traffic light controller
4. Stepper motor controller interface.
5. Displaying a moving/ rolling message in the student trainer kit's output device.
6. Simple arithmetic operations with 8051: Multi precision addition / subtraction / multiplication/ division.
7. Programming with control instructions: Increment / Decrement, Ascending / Descending order, Maximum / Minimum of numbers, Rotate instructions, Hex / ASCII / BCD code conversions.
8. Interface Experiments: A/D Interfacing. D/A Interfacing. Traffic light controller
9. Stepper motor controller interface.
10. Displaying a moving/ rolling message in the student trainer kit's output device.
11. Programming PIC architecture with software tools

TOTAL : 60 PERIODS

COURSE OUTCOMES:

At the end of the course the students will be able to

CO 1 Analyze and perform multi-precision arithmetic operations such as addition, subtraction, multiplication, and division.

CO 2 Examine and implement control instructions like increment, decrement, sorting numbers in ascending/descending order, finding maximum/minimum of numbers, rotate instructions, and Hex/ASCII/BCD code conversions.

CO 3 Investigate and interface A/D and D/A converters and analyze their performance in a traffic light controller system.

CO 4 Design and analyze the performance of a stepper motor controller interface.

CO 5 Develop and evaluate a program to display a moving/rolling message on the student trainer kit's output device.

CO 6 Develop and verify simple programs for PIC using software tools.

COs	POs												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	3	3	2	3	3	-	-	-	1	-	-	-	3	3	3
2	3	3	2	3	3	-	-	-	1	-	-	-	3	3	2
3	3	3	2	3	3	-	-	-	1	-	-	-	3	3	2
4	3	3	2	3	3	-	-	-	1	-	-	-	2	2	1
5	3	3	1	1	2	-	-	-	1	-	-	-	3	3	2
6	3	2	1	1	2	-	-	-	1	-	-	-	3	3	2
Overall correlation	3	2	2	3	3	-	-	-	1	-	-	-	3	3	2

23ES491	APTITUDE AND LOGICAL REASONING –I	L	T	P	C
		0	0	2	1

COURSE OBJECTIVES:

- To improve the problem solving and logical thinking ability of the students.
- To acquaint student with frequently asked questions and patterns in quantitative aptitude and logical reasoning.

UNIT I **4**

Numbers, LCM, HCF, Averages, Ratio & Proportion, Mixtures & Allegation.

UNIT II **4**

Percentages, Time and work, Pipes and Cistern, coding and decoding

UNIT III **4**

Time Speed Distance, Train, Boats and Streams, Analogy

UNIT IV **4**

Data Interpretation(BAR,PIE,LINE), Seating arrangement

UNIT V **4**

Simple Interest and Compound Interest, Profit loss and Discount, Partnership,

TOTAL: 20 PERIODS

COURSE OUTCOMES:

At the end of the course the students will be able to

CO 1 Understand the basic concepts of quantitative ability

CO 2 Understand the basic concepts of logical reasoning Skills

CO 3 Increase in critical thinking skills

CO 4 Able to solve campus placements aptitude papers covering Quantitative Ability, Logical Reasoning Ability

TEXT BOOK:

APTIPEDIA, 2nd edition, Wiley Publishers

REFERENCE BOOKS:

1. Quantitative Aptitude – R.S. Agarwal
2. A Modern Approach To Verbal & Non-Verbal Reasoning By R S Agarwal

KCG COLLEGE OF TECHNOLOGY (AUTONOMOUS)
REGULATIONS 2023
BE -ELECTRONICS AND COMMUNICATION ENGINEERING
CHOICE BASED CREDIT SYSTEM
CURRICULUM FOR SEMESTERS I TO VIII

SEMESTER – I

SL. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
	23IP101	Induction Programme		-	-	-	-	-
THEORY								
1	23HS101	Essential Communication	HSMC	3	0	0	3	3
2	23MA101	Matrices and Calculus	BSC	3	0	0	3	3
3	23CS101	Programming in C	ESC	3	0	0	3	3
4	23HS102	Heritage of Tamils	HSMC	1	0	0	1	1
THEORY AND PRACTICALS								
5	23PH111	Engineering Physics	BSC	3	0	2	5	4
6	23CY111	Engineering Chemistry	BSC	3	0	2	5	4
PRACTICALS								
7	23CS121	C Programming Laboratory	ESC	0	0	4	4	2
8	23HS121	Communication Skills Laboratory	HSMC	0	0	2	2	1
9	23HS122	General Clubs / Technical Clubs / NCC / NSS / Extension Activities	HSMC	0	0	2	2	1*
TOTAL				16	0	12	28	21

SEMESTER – II

SL. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
THEORY								
1	23HS201/ 23HS202	Professional English / Foreign Language	HSMC	3	0	0	3	3
2	23MA203	Statistics and Numerical Methods	BSC	3	1	0	4	4
3	23PH203	Physics for Electronics Engineering	BSC	3	0	0	3	3
4	23EC201	Circuit Analysis	PCC	3	1	0	4	4
5	23HS203	Tamils and Technology	HSMC	1	0	0	1	1
THEORY AND PRACTICALS								
6	23EE284	Basic Electrical and Instrumentation Engineering	ESC	2	0	2	4	3
7	23ME211	Engineering Graphics	ESC	3	0	2	5	4
PRACTICALS								
7	23ME221	Engineering Practices Laboratory	ESC	0	0	4	4	2
8	23EC221	Circuits Analysis Laboratory	PCC	0	0	4	4	2
9	23ES291	Soft Skills	EEC	0	0	2	2	1*
TOTAL				18	2	14	34	26

SEMESTER III

SL. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
THEORY								
1	23MA301	Linear Algebra	BSC	3	1	0	4	4
2	23EC301	Electronic Circuits	PCC	3	0	0	3	3
3	23EC302	Control Systems	PCC	3	0	0	3	3
4	23HS301	Universal Human Values and Ethics	HSMC	3	0	0	3	3
THEORY AND PRACTICALS								
5	23EC311	Digital Systems Design	PCC	3	0	2	5	4
6	23EC312	Signals and Systems	PCC	3	0	2	5	4
PRACTICALS								
7	23EC321	Electronic Circuits Laboratory	PCC	0	0	4	4	2
8	23ES391	Presentation Skills	EEC	0	0	2	2	1*
TOTAL				18	**1**	10	29	23

SEMESTER IV

SL. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
THEORY								
1	23MA402	Probability and Random Processes	BSC	3	1	0	4	4
2	23EC401	Electromagnetic Fields	PCC	3	1	0	4	4
3	23EC402	Communication Systems	PCC	3	0	0	3	3
4	23EC403	Linear Integrated Circuits	PCC	3	0	0	3	3
5		Department Elective 1	DEC	3	0	0	3	3
6		Department Elective 2	DEC	3	0	0	3	3
PRACTICALS								
8	23EC421	Communication Systems Laboratory	PCC	0	0	4	4	2
9	23EC422	Linear Integrated Circuits Lab	PCC	0	0	4	4	2
10	23ES491	Aptitude / Logical reasoning - 1	EEC	0	0	2	2	*1
TOTAL				18	2	12	32	24

SEMESTER V

SL. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
THEORY								
1	23RE501	Research Methodology and Intellectual Property Rights	ESC	2	0	0	2	2
2	23EC501	VLSI and Chip Design	PCC	3	0	0	3	3
3	23EC502	Transmission lines and RF Systems	PCC	3	1	0	4	4
4		Department Elective 3	DEC	3	0	0	3	3
5		Non-Department Elective - 1 (Emerging Technology)	NEC	3	0	0	3	3
THEORY AND PRACTICALS								
6	23EC511	Digital Signal Processing	PCC	3	0	2	5	4
PRACTICALS								
7	23EC521	VLSI Laboratory	PCC	0	0	4	4	2
8	23EC522	Mini Project	EEC	0	0	4	4	2
9	23ES591	Aptitude and Logical Reasoning – 2	EEC	0	0	2	2	*1
TOTAL				17	1	12	30	23

SEMESTER VI

SL. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
THEORY								
1		Department Elective 4	DEC	3	0	0	3	3
2		Department Elective 5	DEC	3	0	0	3	3
3	23EC601	Antenna and Wave Propagation	PCC	3	0	0	3	3
4		Non-Department Elective - 2 (Management / Safety Courses)	NEC	3	0	0	3	3
THEORY AND PRACTICALS								
5	23CE611	Environmental Sciences and Engineering	ESC	3	0	2	5	4
6	23EC611	Microprocessors and Micro controllers	PCC	3	0	2	5	4
PRACTICALS								
7	23EC621	Project Work - Phase 1	EEC	0	0	4	4	2
8	23EC622	Technical Training	EEC	0	0	2	2	1
9	23ES623	Technical Seminar - 1	ESC	0	0	2	2	1
TOTAL				18	0	12	30	24

SEMESTER VII

SL. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
THEORY								
1		Non-Department Elective - 3 (Management Courses)	NEC	3	0	0	3	3
2		Department Elective 6	DEC	3	0	0	3	3
3	23EC701	Optical Communication	PCC	3	0	0	3	3
4	23EC702	Comprehension	EEC	2	0	0	2	2
THEORY AND PRACTICALS								
5	23EC711	Networks and Security	PCC	3	0	2	5	4
PRACTICALS								
6	23EC721	Advanced Communication Laboratory	PCC	0	0	4	4	2
7	23EC722	Project Work - Phase 2	EEC	0	0	6	6	3
8	23EC723	Technical Seminar – 2	ESC	0	0	4	4	2
TOTAL				14	0	16	30	22

SEMESTER VIII

SL. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
PRACTICALS								
1	23EC821/ 23EC822	Internship / Capstone Project	EEC	0	0	20	20	10
TOTAL				0	0	20	20	10

TOTAL CREDITS: 173

DEPARTMENT ELECTIVE COURSES

VERTICAL 1: Semiconductor Chip Design and Testing

SL. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1	23EC031	Advanced Digital System Design	DEC	3	0	0	3	3
2	23EC032	ASIC Design	DEC	3	0	0	3	3
3	23EC033	Low Power IC Design	DEC	3	0	0	3	3
4	23EC034	VLSI Testing and Design For Testability	DEC	3	0	0	3	3
5	23EC035	Physical Design	DEC	3	0	0	3	3
6	23EC036	Mixed Signal IC Design Testing	DEC	3	0	0	3	3

VERTICAL 2: SENSOR TECHNOLOGIES AND IOT

SL. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1	23EC037	Embedded Systems and IOT Design	DEC	3	0	0	3	3
2	23EC038	IoT Based System Design	DEC	3	0	0	3	3
3	23EC039	Wireless Sensor Network Design	DEC	3	0	0	3	3
4	23EC040	Industry IoT and Industry 4.0	DEC	3	0	0	3	3
5	23EC041	MEMS Design	DEC	3	0	0	3	3
6	23EC042	Fundamentals of Nano electronics	DEC	3	0	0	3	3

VERTICAL 3: High Speed Communications

SL. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1	23EC043	Wireless Communication	DEC	3	0	0	3	3
2	23EC044	Microwave Communication	DEC	3	0	0	3	3
3	23EC045	Satellite Communication	DEC	3	0	0	3	3
4	23EC046	Radar Technologies	DEC	3	0	0	3	3
5	23EC047	4G/5G Communication Networks	DEC	3	0	0	3	3
6	23EC048	Wireless Broadband Communication	DEC	3	0	0	3	3

VERTICAL 4: NETWORKS AND CYBER SECURITY

SL. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1	23EC049	Network Essentials	DEC	2	0	2	3	3
2	23EC050	Network Engineering	DEC	2	0	2	3	3
3	23EC051	Switching, Routing, And Wireless Essentials	DEC	2	0	2	3	3
4	23EC052	Enterprise Networking, Security, and Automation	DEC	2	0	2	3	3
5	23EC053	Network Design	DEC	2	0	2	3	3
6	23EC054	Cyber Security	DEC	2	0	2	3	3

VERTICAL 5: BIO MEDICAL TECHNOLOGIES

SL. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1	23EC055	Wearable Devices	DEC	3	0	0	3	3
2	23EC056	Human Assist Devices	DEC	3	0	0	3	3
3	23EC057	Therapeutic Equipment	DEC	3	0	0	3	3
4	23EC058	Medical Imaging Systems	DEC	3	0	0	3	3
5	23EC059	Brain Computer Interface and Applications	DEC	3	0	0	3	3
6	23EC060	Body Area Networks	DEC	3	0	0	3	3

VERTICAL 6: SIGNAL PROCESSING

SL. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1	23EC061	Advanced Digital Signal Processing	DEC	3	0	0	3	3
2	23EC062	Image Processing	DEC	3	0	0	3	3
3	23EC063	Speech Processing	DEC	3	0	0	3	3
4	23EC064	Software Defined Radio	DEC	3	0	0	3	3
5	23EC065	DSP Architecture and Programming	DEC	2	0	2	3	3
6	23EC066	Computer Vision	DEC	2	0	2	3	3

NON-DEPARMENT ELECTIVE

EMERGING TECHNOLOGY

SL NO	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK L	T	P	TOTAL CONTACT PERIODS	CREDITS
1	23NE972	Block Chain Technology	NEC	3	0	0	3	3
2	23NE973	Artificial Intelligence and Machine Learning Fundamentals	NEC	3	0	0	3	3
3	23NE974	Augmented Reality and Virtual Reality	NEC	3	0	0	3	3
4	23NE977	Remote Sensing Concepts	NEC	3	0	0	3	3
5	23NE978	Urban Agriculture	NEC	3	0	0	3	3
6	23NE980	Renewable Energy Systems	NEC	3	0	0	3	3
7	23NE981	Integrated Energy Planning for Sustainable Development	NEC	3	0	0	3	3
8	23NE982	Resource Management Techniques	NEC	3	0	0	3	3
9	23NE983	Aviation Management	NEC	3	0	0	3	3
10	23NE984	Quality Engineering	NEC	3	0	0	3	3
11	23NE986	Foundation of Robotics	NEC	3	0	0	3	3
12	23NE987	Space Engineering	NEC	3	0	0	3	3
13	23NE988	Electric and Hybrid Vehicles	NEC	3	0	0	3	3

MANAGEMENT COURSES

SL NO	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK L	T	P	TOTAL CONTACT PERIODS	CREDITS
1	23HS971	Total Quality Management	NEC	3	0	0	3	3
2	23HS972	Engineering Economics and Financial Accounting	NEC	3	0	0	3	3
3	23HS973	Engineering Management and Law	NEC	3	0	0	3	3
4	23HS974	Knowledge Management	NEC	3	0	0	3	3
5	23HS975	Industrial Management	NEC	3	0	0	3	3
6	23HS976	Entrepreneurship and Business Opportunities	NEC	3	0	0	3	3
7	23HS977	Modern Business Administration and Financing	NEC	3	0	0	3	3
8	23HS978	Essentials of Management	NEC	3	0	0	3	3

SAFETY COURSES

SL NO	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1	23HS979	Disaster Management	NEC	3	0	0	3	3
2	23HS980	Industrial Safety	NEC	3	0	0	3	3
3	23HS981	Automotive Safety	NEC	3	0	0	3	3

SEMESTER-WISE CREDIT DISTRIBUTION

SEMESTER	HSMC	BSC	ESC	PCC	DEC	NEC	EEC	Total
Semester I	5	11	5					21
Semester II	4	7	9	6				26
Semester III	3	4		16				23
Semester IV		4		14	6			24
Semester V			2	9	6	3	2	22
Semester VI			5	8	6	3	3	25
Semester VII			2	12		3	5	22
Semester VIII							10	10
Total - curriculum- ECE	**12**	**26**	**23**	**65**	**18**	**9**	**20**	**173**

23MA301 LINEAR ALGEBRA

L	T	P	C
3	1	0	4

COURSE OBJECTIVES:

- To test the consistency and solve system of linear equations
- To find the basis and dimension of vector space
- To obtain the matrix of linear transformation and its eigenvalues and eigenvectors
- To find orthonormal basis of inner product space and find least square approximation
- To find eigenvalues of a matrix using numerical techniques and perform matrix decomposition.

UNIT I MATRICES AND SYSTEM OF LINEAR EQUATIONS 9+3

Matrices - Row echelon form - Rank - System of linear equations - Consistency - Gauss elimination method - Gauss Jordon method – Gauss Seidel Method

UNIT II VECTOR SPACES 9+3

Vector spaces - Subspace - Linear independence and dependence – Linear Span - Basis and dimension – Maximal Linearly Independent Subsets.

UNIT III LINEAR TRANSFORMATION 9+3

Linear transformation - Rank space and null space - Rank and nullity - Dimension theorem - Matrix representation of linear transformation - Eigenvalues and eigenvectors of linear transformation – Invertibility and Isomorphisms – Dual Spaces – Homogeneous Linear Differential Equations with Constant coefficients .

UNIT IV INNER PRODUCT SPACES 9+3

Inner product and norms - Properties - Orthogonal, Orthonormal vectors - Gram Schmidt orthonormalization process – Adjoint of Linear operator – Normal and self adjoint operators – Unitary and orthogonal operators and their Matrices

UNIT V EIGENVALUE PROBLEMS AND MATRIX DECOMPOSITION 9+3

Eigen value Problems - Power method, Jacobi rotation method - Singular value decomposition - QR decomposition – Generalized Inverse - Least square solution

TOTAL: 60 PERIODS

COURSE OUTCOMES:

At the end of the course the students will be able to

CO 1 Test the consistency and solve system of linear equations.

CO 2 Find the basis and dimension of vector space.

CO 3 Obtain the matrix of linear transformation and its eigenvalues and eigenvectors.
CO 4 Find orthonormal basis of inner product space and least square approximation.
CO 5 Find eigenvalues of a matrix using numerical techniques
CO 6 Perform Matrix Decomposition using different techniques

TEXT BOOKS:

1. Friedberg A.H, Insel A.J. and Spence L, "Linear Algebra", Prentice Hall of India, New Delhi, 2004.
2. Faires J.D. and Burden R., "Numerical Methods", Brooks/Cole (Thomson Publications), New Delhi, 2002.

REFERENCE BOOKS:

1. Kumaresan S, "Linear Algebra - A geometric approach", Prentice Hall of India, New Delhi, Reprint, 2010.
2. P.S.Das – "Numerical Analysis", Pearson Educations, New Delhi, 2002
3. Richard Branson, "Matrix Operations", Schaum's outline series, 1989.

COs	**POs**												**PSOs**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
1	3	2	2	-	-	-	-	-	-	-	-	-	-	-	2
2	3	2	2	-	-	-	-	-	-	-	-	-	-	-	2
3	3	2	2	-	-	-	-	-	-	-	-	-	-	-	2
4	3	2	2	-	-	-	-	-	-	-	-	-	-	-	2
5	3	2	2	-	-	-	-	-	-	-	-	-	-	-	2
6	3	2	2	-	-	-	-	-	-	-	-	-	-	-	2
Overall correlation	3	2	2	-	-	-	-	-	-	-	-	-	-	-	2

23EC301 ELECTRONIC CIRCUITS

	L	T	P	C
	3	0	0	3

COURSE OBJECTIVES:

- To give a comprehensive exposure to all types of devices and circuits constructed with discrete components. This helps to develop a strong basis for building linear and digital integrated circuits
- To analyze the frequency response of small signal amplifiers
- To design and analyze single stage and multistage amplifier circuits
- To study about feedback amplifiers & oscillators principles

UNIT I CHARACTERISTICS OF SEMICONDUCTORS DEVICES 9

PN junction diode, Zener diode, BJT - Construction, working and characteristics of CE, CB and CC configurations- diffusion and transition capacitance, FinFET, MOSFET, UJT – structure, operation and V-I characteristics, - Rectifiers – Half Wave and Full Wave Rectifier, Zener as regulator.

UNIT II BJT AND FINFET AMPLIFIERS 9

Load line, operating point, biasing methods for BJT - fixed bias, voltage divider bias, collector to base bias, collector to emitter feedback bias, emitter feedback bias - Biasing methods for FinFET - BJT small signal model – Analysis of CE, CB, CC amplifiers – FINFET small signal model.

UNIT III FREQUENCY RESPONSE OF AMPLIFIERS 9

Gain and frequency response – BJT, FINFET - High frequency analysis. Bias compensation circuits: Diode compensation, thermistor compensation and sensistor compensation.

UNIT IV MULTISTAGE AMPLIFIERS & TUNED AMPLIFIERS 10

Cascade Amplifier, Cascode amplifier, Differential amplifier – Common mode and Difference mode analysis – FinFET input stages – Tuned amplifiers : Single tuned amplifier, Double tuned Amplifier, Stagger – Gain and frequency response – Neutralization methods.

UNIT V POWER AMPLIFIERS AND DC/DC CONVERTERS 8

Power amplifiers- class A-Class B-Class AB-Class C-Power MOSFET-Temperature Effect-Class AB Power amplifier using FET –DC/DC convertors – Buck, Boost, Buck-Boost analysis and design

TOTAL: 45 PERIODS

COURSE OUTCOMES:

At the end of the course the

CO1: Analyse the behaviour of semiconductor devices.

CO2: Acquire an in-depth knowledge about various transistor biasing and analyse the small signal model of amplifiers

CO3: Analyse the gain and high frequency response of amplifiers

CO4: Interpret the design and analysis of multistage amplifier and tuned amplifier circuits.

CO5: Summarise the various power amplifiers

CO6: Explain the various DC/DC converters

TEXT BOOKS:

1. Donald.A. Neamen, "Electronic Circuit Analysis and Design", Tata McGraw Hill, 3rd Edition, 2010.
2. Robert L. Boylestad and Louis Nasheresky, "Electronic Devices and Circuit Theory", 10th Edition, Pearson Education / PHI, 2008.

REFERENCE BOOK:

1. David A. Bell, "Electronic Devices and Circuits", Oxford Higher Education press, 5 th Edition, 2010.
2. D.Schilling and C.Belove, "Electronic Circuits", McGraw Hill, 3 rd Edition, 1989
3. Muhammad H.Rashid, "Power Electronics", Pearson Education / PHI , 2004.
4. Adel .S. Sedra, Kenneth C. Smith, "Micro Electronic Circuits", Oxford University Press, 7 th Edition, 2014.

COs	POs												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	2	1	-	-	1	1	-	1	-	1	1	1	2	1	1
2	2	1	-	-	1	1	-	1	-	1	1	1	2	1	1
3	2	1	-	-	1	1	-	1	-	1	1	1	2	1	1
4	2	1	-	-	1	1	-	1	-	1	1	1	2	1	1
5	2	1	-	-	1	1	-	1	-	1	1	1	2	1	1
6	3	1	1	1	1	1	-	1	-	1	1	1	3	1	1
Overall correlation	3	2	1	1	2	2	-	2	-	2	2	2	3	2	2

23EC302 CONTROL SYSTEMS

L	T	P	C
3	0	0	3

COURSE OBJECTIVES:

- To introduce the components and representation of control systems
- To learn methods of analyzing time response of systems
- To understand various techniques to analyze frequency response of systems.
- To learn the concept of stability analysis in control systems
- To study different approaches for state variable analysis

UNIT I SYSTEM COMPONENTS AND THEIR REPRESENTATION 9

Introduction to Control System, Terminology and Basic Structure, Feed forward and Feedback control theory, Electrical and Mechanical transfer Function Models, Block diagram Models, Signal flow graphs, Multivariable control system.

UNIT II TIME RESPONSE ANALYSIS 9

Transient response, Steady state response, Performance of standard first order and second order systems, Zeroes, Poles and Type of system, Analytical design - PD, PI and PID control systems.

UNIT III FREQUENCY RESPONSE AND SYSTEM ANALYSIS 9

Closed loop frequency response, Performance specification in frequency domain, Frequency response of standard second order system, Bode plot, Polar plot, Cascade lead compensation, Cascade lag compensation, Cascade lead-lag compensation.

UNIT IV CONCEPTS OF STABILITY ANALYSIS 9

Concept of stability – Bounded Input and Bounded Output, Routh stability criterion, Relative stability, Root locus concept, Guidelines for sketching root locus, Nyquist stability criterion.

UNIT V CONTROL SYSTEM ANALYSIS USING STATE VARIABLE METHODS. 9

State variable representation, Conversion of state variable models to transfer functions, Conversion of transfer functions to state variable models, Solution of state equations, Concepts of Controllability and Observability, Stability of linear systems, Equivalence between transfer function and state variable representations, State variable analysis of digital control system.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

At the end of the course the

CO1: Explain the basic elements of control systems and their modelling using block diagram reduction and signal flow graph.

CO2: Apply time domain analysis for first and second order systems.

CO3: Develop compensation techniques in frequency domain.

CO4: Utilize Bode plot and Polar plot in control system analysis.

CO5: Apply Routh criteria, Root locus method and Nyquist stability criterion for stability analysis.

CO6: Explain state variable analysis method using state space representation.

TEXT BOOKS:

1. M.Gopal, ―Control System – Principles and Design‖, Tata McGraw Hill, 4th Edition, 2012.
2. J.Nagrath and M.Gopal, ―Control System Engineering‖, New Age International Publishers, 5th Edition, 2007.

REFERENCE BOOKS:

1. K. Ogata, ‗Modern Control Engineering ', 5th edition, PHI, 2012.
2. S.K.Bhattacharya, Control System Engineering, 3rd Edition, Pearson, 2013.
3. Benjamin.C. Kuo, ―Automatic control systems, Prentice Hall of India, 7th Edition,1995.
4. A.Nagoor Kani - Control Systems Engineering, CBS Publishers & Distributors, 2021

COs	POs												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	3	3	3	2	2	2	-	-	-	-	2	3	3	3	3
2	3	3	3	3	2	3	-	-	-	-	2	2	3	3	3
3	3	2	3	3	2	2	-	-	-	-	2	3	3	2	3
4	3	2	3	3	2	2	-	-	-	-	2	3	3	2	3
5	3	3	3	2	2	2	-	-	-	-	2	2	3	3	3
6	2	2	3	3	2	3	-	-	-	-	2	3	2	2	3
Overall correlation	**3**	**3**	**3**	**3**	**2**	**2**	-	-	-	-	**2**	**3**	**3**	**3**	**3**

23HS301	UNIVERSAL HUMAN VALUES AND ETHICS	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- Development of a holistic perspective based on self-exploration about themselves (human being), family, society and nature/existence.
- Understanding (or developing clarity) of the harmony in the human being, family, society and nature/existence.
- Strengthening of self-reflection.
- Development of commitment and courage to act.

UNIT I COURSE INTRODUCTION 9

Need, Basic Guidelines, Content and Process for Value Education - Understanding the need, basic guidelines, content and process for Value Education -Self Exploration–what is it? - its content and process; 'Natural Acceptance' and Experiential Validation- as the mechanism for self exploration - Continuous Happiness and Prosperity- A look at basic Human Aspirations -Right understanding, Relationship and Physical Facilities- the basic requirements for fulfilment of aspirations of every human being with their correct priority -Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario -Method to fulfil the above human aspirations: understanding and living in harmony at various levels.

UNIT II UNDERSTANDING HARMONY IN THE HUMAN BEING 9

Harmony in Myself- Understanding human being as a co-existence of the sentient 'I' and the material 'Body' -Understanding the needs of Self ('I') and 'Body' - Sukh and Suvidha- Understanding the Body as an instrument of 'I' (I being the doer, seer and enjoyer) - Understanding the characteristics and activities of 'I' and harmony in 'I' -Understanding the harmony of I with the Body: Sanyam and Swasthya; correct appraisal of Physical needs, meaning of Prosperity.

UNIT III UNDERSTANDING HARMONY IN THE FAMILY AND SOCIETY 9

Harmony in Human-Human Relationship -Understanding Harmony in the family – the basic unit of human interaction -Understanding values in human-human relationship; meaning of Nyaya and program for its fulfilment to ensure satisfaction; Trust(Vishwas) and Respect as the foundational values of relationship -Understanding the meaning of Vishwas; Difference between intention and competence -Understanding the meaning of Samman, Difference between respect and differentiation; the other salient values in relationship -Understanding the harmony in the society (society being an extension of family)-Visualizing a universal harmonious order in society- Undivided Society (Akhand Samaj), Universal Order- from family to world family.

UNIT IV ENGINEERING ETHICS **9**

Senses of ‗Engineering Ethics„ – Variety of moral issues – Types of inquiry – Moral dilemmas – Moral Autonomy – Kohlberg's theory – Gilligan's theory – Consensus and Controversy – Models of professional roles - Theories about right action – Self-interest – Customs and Religion – Uses of Ethical Theories.

UNIT V SAFETY, RESPONSIBILITY AND RIGHTS **9**

Safety and Risk – Assessment of Safety and Risk – Risk Benefit Analysis and Reducing Risk - Respect for Authority – Collective Bargaining – Confidentiality – Conflicts of Interest – Occupational Crime – Professional Rights – Employee Rights – Intellectual Property Rights (IPR) – Discrimination-Moral Leadership –Code of Conduct – Corporate Social Responsibility.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

At the end of the course the students will be able to

CO1: Understand the need of value education.

CO2: Comprehend the difference between self and body.

CO3: Understand the need to exist as an unit of Family and society.

CO4: Understand Harmony at all levels.

CO5: Apply the values acquired in the professional front.

CO6: Identify appropriate technologies for ecofriendly production systems.

TEXT BOOKS:

1. Human Values and Professional Ethics by R R Gaur, R Sangal, G P Bagaria, Excel Books, New Delhi, 2010 3.
2. Mike W. Martin and Roland Schinzinger, ―Ethics in Engineering‖, Tata McGraw Hill, New Delhi, 2003.
3. Govindarajan M, Natarajan S, Senthil Kumar V. S, ―Engineering Ethics‖, Prentice Hall of India, New Delhi, 2004

REFERENCE BOOKS:

1. Jeevan Vidya: Ek Parichaya, A Nagaraj, Jeevan Vidya Prakashan, Amarkantak, 1999.
2. Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004.
3. The Story of Stuff (Book).
4. The Story of My Experiments with Truth - by Mohandas Karamchand Gandhi AICTE Model Curriculum in Humanities, Social Science and Management Courses (UG Engineering & Technology) 169 | Page .
5. Small is Beautiful - E. F Schumacher.
6. Slow is Beautiful - Cecile Andrews.
7. Economy of Permanence - J C Kumarappa 8. Bharat Mein Angreji Raj – Pandit Sunderlal.

8. Rediscovering India - by Dharampal.
9. Hind Swaraj or Indian Home Rule - by Mohandas K. Gandhi .
10. India Wins Freedom - Maulana Abdul Kalam Azad.
11. Vivekananda - Romain Rolland (English) 13. Gandhi - Romain Rolland (English).
12. Charles B. Fleddermann, ―Engineering Ethics‖, Pearson Prentice Hall, New Jersey, 2004.
13. Charles E. Harris, Michael S. Pritchard and Michael J. Rabins, ―Engineering Ethics – Concepts and Cases‖, Cengage Learning, 2009.

WEB SOURCES:

1. www.onlineethics.org
2. www.nspe.org
3. www.globalethics.org

COs	POs												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	-	-	-	-	-	3	3	3	3	3	-	-	-	-	3
2	-	-	-	-	-	3	3	3	3	3	-	-	-	-	3
3	-	-	-	-	-	3	3	3	3	3	-	-	-	-	3
4	-	-	-	-	-	3	3	3	3	3	-	-	-	-	3
5	-	-	-	-	-	3	3	3	3	3	-	-	-	-	3
6	-	-	-	-	-	3	3	3	3	3	-	-	-	-	3
Overall correlation	-	-	-	-	-	3	3	3	3	3	-	-	-	-	3

23ES311	DIGITAL SYSTEM DESIGN	L	T	P	C
		3	0	2	4

COURSE OBJECTIVES:

- To present the fundamentals of digital circuits and simplification methods
- To practice the design of various combinational digital circuits using logic gates
- To bring out the analysis and design procedures for synchronous and asynchronous Sequential circuits
- To learn integrated circuit families.
- To introduce semiconductor memories and related technology

UNIT I BASIC CONCEPTS 9

Review of number systems – Representation - Conversions, Review of Boolean algebra - Theorems, Sum of Product and Product of Sum Simplification, Canonical forms min term and max term, Simplification of Boolean expressions - Karnaugh map, Completely and Incompletely specified functions, Implementation of Boolean expressions using Universal gates, Tabulation methods.

UNIT II COMBINATIONAL LOGIC CIRCUITS 9

Problem formulation and design of combinational circuits - Code-Converters, Half and Full Adders, Binary Parallel Adder – Carry look ahead Adder, BCD Adder, Magnitude Comparator, Decoder, Encoder, Priority Encoder, Mux/De-mux, Case study: Parity Generator/Checker, Seven Segment display decoder

UNIT III SYNCHRONOUS SEQUENTIAL CIRCUITS 9

Latches, Flip flops – SR, JK, T, D, Master/Slave FF, Triggering of FF, Analysis and design of clocked sequential circuits – Design - Moore/Mealy models, state minimization, state assignment, lock - out condition circuit implementation - Counters, Ripple Counters, Ring Counters, Shift registers, Universal Shift Register.

UNIT IV ASYNCHRONOUS SEQUENTIAL CIRCUITS 9

Stable and Unstable states, output specifications, cycles and races, state reduction, race free assignments, Hazards, Essential Hazards, Fundamental and Pulse mode sequential circuits, Design of Hazard free circuits.

UNIT V LOGIC FAMILIES AND PROGRAMMABLE LOGIC DEVICES 9

Logic families- Propagation Delay, Fan - In and Fan - Out - Noise Margin - RTL, TTL, ECL, CMOS - Comparison of Logic families - Implementation of combinational logic/ sequential logic design using standard ICs, PROM, PLA and PAL, basic memory, static ROM,PROM,EPROM,EEPROM EAPROM.

TOTAL: 45 PERIODS

PRACTICAL EXERCISES: 30 PERIODS

1. Design of adders and subtractors & code converters using K Map
2. Design of Multiplexers & Demultiplexers using K Map
3. Design of Encoders and Decoders.
4. Design of Magnitude Comparators using IC 7483 and gates
5. Design and implementation of counters using flip-flops
6. Design and implementation of shift registers.

COURSE OUTCOMES:

At the end of the course the students will be able to

CO1: Interpret number system conversions and fundamentals of digitals systems.
CO2: Make use of Karnaugh map and Quine Mc-cluskey method for minimizing Boolean equations
CO3: Utilize logic gates and karnaugh map to design and implement combinational circuits
CO4: Construct synchronous sequential circuits using the concepts of flipflops
CO5: Illustrate the design of asynchronous sequential circuits and hazards
CO6: Explain various memory devices and digital integrated circuits.

TOTAL: 45 + 30 = 75 PERIODS

TEXT BOOKS:

1. M. Morris Mano and Michael D. Ciletti, 'Digital Design', Pearson, 5th Edition, 2013.(Unit - I - V).
2. John M Yarbrough,-Digital Logic Applications and Design, Thomson Learning,2001.

REFERENCE BOOKS:

1. Charles H. Roth, Jr, 'Fundamentals of Logic Design', Jaico Books, 4th Edition, 2002.
2. William I. Fletcher, "An Engineering Approach to Digital Design", Prentice- Hall of India, 1980.
3. Floyd T.L., "Digital Fundamentals", Charles E. Merril publishing company,1982.
4. John. F. Wakerly, "Digital Design Principles and Practices", Pearson Education, 4th Edition, 2007.

COs	**POs**												**PSOs**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
1	2	1	-	-	1	-	-	-	-	1	-	-	2	1	-
2	3	2	1	1	1	-	-	-	-	1	-	-	3	1	-
3	3	2	1	1	2	-	-	-	2	1	-	-	3	1	-
4	3	2	1	1	2	-	-	-	2	1	-	-	3	1	-
5	2	1	-	-	1	-	-	-	2	1	-	-	2	1	-
6	2	1	-	-	1	-	-	-	-	1	-	-	2	1	-
Overall correlation	**3**	**2**	**1**	**1**	**2**	-	-	-	**2**	**2**	-	-	**3**	**2**	-

23EC312 SIGNALS AND SYSTEMS

	L	T	P	C
	3	0	2	4

COURSE OBJECTIVES:

- To understand the basic properties of signal & systems
- To know the methods of characterization of LTI systems in time domain
- To analyze continuous time signals and system in the Fourier and Laplace domain
- To analyze discrete time signals and system in the Fourier and Z transform domain

UNIT I CLASSIFICATION OF SIGNALS AND SYSTEMS 9

Standard signals- Step, Ramp, Impulse, Real and complex exponentials and Sinusoids-Classification of signals – Continuous time (CT) and Discrete Time (DT) signals, Periodic & Aperiodic signals, Deterministic & Random signals, Energy & Power signals - Classification of systems- CT systems and DT systems – Linear & Nonlinear, Time-variant & Time-invariant, Causal & Non-causal, Stable & Unstable-Static and Dynamic System.

UNIT II ANALYSIS OF CONTINUOUS TIME SIGNALS 9

Fourier Transform – Properties-Linearity-Time Shifting-Time reversal -Time Scaling-Differentiation-Convolution- Parseval's Theorem- Inverse Fourier Transform-Laplace Transform -Basic Properties- Linearity-Time Shifting-Time reversal -Time Scaling-Differentiation-Convolution -Initial value theorem-Final Value Theorem-Inverse Laplace Transform.

UNIT III LINEAR TIME INVARIANT CONTINUOUS TIME SYSTEMS 9

Fourier and Laplace transforms in analysis of CT systems- Impulse response and step response (without initial conditions) -Convolution integrals- Differential Equation-Realization of CT systems-Direct Form-I , Direct Form-II Cascade and Parallel forms .

UNIT IV ANALYSIS OF DISCRETE TIME SIGNALS 9

Fourier Transform of discrete time signals (DTFT)– Properties of DTFT- Z Transform – Unilateral & Bilateral Z transforms – Properties-Inverse Z transform: Power series expansion – Long Division method-Partial fraction method-Convolution method

UNIT V LINEAR TIME INVARIANT-DISCRETE TIME SYSTEMS 9

Discrete Fourier Transform and Z Transform in analysis of DT systems -Impulse response and step response (without initial conditions)–Difference Equations-Convolution sum-Graphical and Matrix method- Realization of DT systems-Direct Form-I and Direct Form-II Cascade and Parallel forms.

TOTAL:45 PERIODS

PRACTICAL EXPERIMENTS: 30 PERIODS

MATLAB / EQUIVALENT SOFTWARE PACKAGE BASED IMPLEMENTATION

1. Introduction to MATLAB
2. Generation of basic continuous time signal
3. Generation of basic Discrete time signal
4. Linear Convolution on Discrete Time Signals
5. Operation on Signals
6. Linearity, Causality and Stability of the system
7. Convolution on Continuous Time Signals using Laplace Transform
8. Sampling Theorem
9. Convolution on Discrete Time Signals using Z Transform

TOTAL: 45 + 30 = 75 PERIODS

COURSE OUTCOMES:

At the end of the course the students will be able to

CO1: Determine if a given system is linear/causal/stable
CO2: Determine the frequency components present in a deterministic signal
CO3: Characterize continuous LTI systems in the time domain and frequency domain
CO4: Characterize discrete LTI systems in the time domain and frequency domain
CO5: Compute the output of an LTI system in the time and frequency domains
CO6:. Analyze the Discrete time systems using Laplace and Fourier Transform

TEXT BOOKS:

1. Oppenheim, Willsky and Hamid, "Signals and Systems", 2nd Edition, Pearson Education, New Delhi, 2015.(Units I - V)
2. Simon Haykin, Barry Van Veen, "Signals and Systems", 2nd Edition, Wiley, 2002

REFERENCE BOOKS:

1. B. P. Lathi, "Principles of Linear Systems and Signals", 2nd Edition, Oxford, 2009.
2. M. J. Roberts, "Signals and Systems Analysis using Transform methods and MATLAB", McGraw- Hill Education, 2018.
3. John Alan Stuller, "An Introduction to Signals and Systems", Thomson, 2007.

COs	POs												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	3	-	3	-	3	2	-	-	-	-	-	3	-	-	1
2	3	-	3	-	-	2	-	-	-	-	-	3	-	3	-
3	3	3	-	-	3	2	-	-	-	-	-	3	2	-	-
4	3	3	-	-	3	2	-	-	-	-	-	3	-	3	1
5	3	3	-	3	3	2	-	-	-	-	-	3	-	3	1
6	2	3	2	2	1	-	-	-	-	-	-	-	-	-	-
Overall correlation	3	3	3	3	3	2	-	-	-	-	-	3	2	3	1

23EC321 **ELECTRONIC CIRCUITS LABORATORY** **L T P C**
0 0 2 4

COURSE OBJECTIVES:

- To Design & Implement characteristics of PN Junction diode and Zener diode.
- To design rectifiers using filters.
- To Design & Implement characteristics of amplifier.

LIST OF EXPERIMENTS

1. Characteristics of PN Junction Diode and Zener diode.
2. Design Full Wave Rectifier with Filters.
3. Design of Zener diode Regulator.
4. Design of Common Emitter Transistor and plot input-output Characteristics.
5. MOSFET Drain current and Transfer Characteristics.
6. Design and determine Frequency response of CE and CS amplifiers.
7. Design and determine Frequency response of CB and CC amplifiers.
8. Design and determine Frequency response of Cascode Amplifier
9. CMRR measurement of Differential Amplifier
10. Mini Project

TOTAL: 45 PERIODS

COURSE OUTCOMES:

At the end of the course the students will be able to

CO1: Characteristics of PN Junction Diode and Zener diode.
CO2: Design and Testing of BJT and MOSFET amplifiers.
CO3: Operation of Rectifiers and Filters.
CO4: Frequency response of BJT and MOSFET amplifiers.
CO5: Operation of Multistage Amplifiers & Power amplifiers.
CO6: Operation of Oscillators.

COs	POs												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	2	2	3	3	2	1	-	-	-	-	-	1	2	1	1
2	2	2	3	3	2	1	-	-	-	-	-	1	2	1	1
3	2	-	2	-	1	1	-	-	-	-	-	1	2	1	1
4	-	-	-	-	3	1	-	-	-	-	-	1	2	1	1
5	-	-	-	-	2	1	-	-	-	-	-	1	2	1	1
6	2	2	-	3	2	1	-	-	-	-	-	1	2	1	1
Overall correlation	2	2	3	3	2	1	-	-	1	-	-	1	2	1	1

23ES391 PRESENTATION SKILLS

	L	T	P	C
	0	**0**	**2**	**1***

COURSE OBJECTIVES:

- To help learners use brainstorming techniques for generating, organizing and outlining ideas.
- To familiarize learners with different speech structures by engaging them in watching speeches with great opening and closing
- To give practice on voice modulation and use of body language and eye contact for making captivating presentations
- To give hands on training on preparing presentation slides and using remote presentation tools
- To train students on responding to question and feedback with confidence.

UNIT I BRAINSTORMING AND OUTLINING 6

Mind Mapping based on prior knowledge, collecting additional information from external resources, giving prompts to Generative AI tools seeking information, organizing ideas generated, knowing your audience

UNIT II STRUCTURING THE PRESENTATION 6

3 Ts of a presentation, writing effective introduction- Beginning the introduction with a hook (question, data, storytelling) and closing the introduction with the objective of the presentation. Structuring the body paragraphs -Choosing key ideas from the list of ideas generated during brainstorming. Substantiating ideas with examples, data, reasons and anecdotes. Summarizing the ideas for conclusion.

UNIT III DELIVERY TECHNIQUES 6

Vocal variety, intonation, reducing filler words and improving articulation, inflection, engaging the audience. Body language- eye contact, gestures, movement on stage.

UNIT IV USE OF TECHNOLOGICAL AIDS 6

Use of presentation software like MS Power Point, Google Slides etc., incorporating images, graphs, charts and videos, using interactive tools like quizzes and polls, using remote presentation tools like zoom, MS Teams, WebEx for screen sharing, virtual whiteboards and chat functionalities, incorporating AR/VR for more immersive presentations .

UNIT V HANDLING QUESTIONS AND FEEDBACK 6

Audience engagement through questions, PAR (Point, Answer, Redirect) strategy for structuring responses to questions. Understanding feedback process - Receiving, interpreting and evaluating constructively, active listening techniques for processing feedback, responding to feedback- acknowledging, clarifying and appreciating, Dealing with challenging feedback.

TOTAL: 30 PERIODS

COURSE OUTCOMES:

After completion of the course, the students should be able to

CO1 construct ideas for presentation through mind mapping techniques

CO2 organize ideas and structure the presentation with captivating introduction, body paragraphs illustrated with examples and reasons and compelling conclusion

CO3 apply vocal variety and body language techniques to enhance delivery

CO4 prepare engaging presentations by integrating multimedia elements

CO5 demonstrate proficiency in delivering presentations in remote platforms utilizing various technological tools and strategies to engage audience in virtual environments

CO6 exhibit active listening skills by responding to questions with clarity and confidence and incorporating constructive feedback for professional development

TEXT BOOKS:

1. "Slide:ology: The Art and Science of Creating Great Presentations" by Nancy Duarte. O'Reilly Media
2. "The Naked Presenter: Delivering Powerful Presentations With or Without Slides" by Garr Reynolds. New Riders

REFERENCE BOOK:

Talk Like TED: The 9 Public-Speaking Secrets of the World's Top Minds" by Carmine Gallo.

23MA402 PROBABILITY AND RANDOM PROCESSES

	L	T	P	C
	3	1	0	4

COURSE OBJECTIVES:

- To provide necessary basic concepts in probability and random processes for applications such as random signals, linear systems in communication engineering.
- To understand the basic concepts of probability, one and two dimensional random variables and to introduce some standard distributions applicable to engineering which can describe real life phenomenon.
- To understand the basic concepts of random processes which are widely used in IT fields.
- To understand the concept of correlation and spectral densities.
- To understand the significance of linear systems with random inputs.

UNIT I PROBABILITY AND RANDOM VARIABLES 9+3

Probability – Axioms of probability – Conditional probability – Baye's theorem – Discrete and continuous random variables – Moments – Moment generating functions – Binomial, Poisson, Geometric, Uniform, Exponential and Normal distributions.

UNIT II TWO - DIMENSIONAL RANDOM VARIABLES 9+3

Joint distributions – Marginal and conditional distributions – Covariance – Correlation and linear regression – Transformation of random variables – Central limit theorem (for independent and identically distributed random variables).

UNIT III RANDOM PROCESSES 9+3

Classification – Stationary process – Markov process – Markov chain – Poisson process – Random telegraph process.

UNIT IV CORRELATION AND SPECTRAL DENSITIES 9+3

Auto correlation functions – Cross correlation functions – Properties – Power spectral density – Cross spectral density – Properties.

UNIT V LINEAR SYSTEMS WITH RANDOM INPUTS 9+3

Linear time invariant system – System transfer function – Linear systems with random inputs – Auto correlation and cross correlation functions of input and output.

TOTAL: 60 PERIODS

COURSE OUTCOMES:

At the end of the course the students will be able to

CO 1 Apply the fundamental knowledge of the concepts of probability and one dimensional random variables

CO 2 Analyze standard probability distributions which can describe real life phenomenon.

CO 3 Apply the basic concepts of two dimensional random variables in engineering applications.

CO4 Apply the concepts of random processes in real life situations
CO5 Solve problems in correlation and spectral densities
CO6 Examine the linear systems with random inputs

TEXT BOOKS:

1. Ibe, O.C.," Fundamentals of Applied Probability and Random Processes ", 1st Indian Reprint, Elsevier, 2007.
2. Peebles, P.Z., "Probability, Random Variables and Random Signal Principles ", Tata McGraw Hill, 4th Edition, New Delhi, 2002.
3. Probability and Random Processes by P.Sivaramakrishna Das and C.Vijayakumari

REFERENCE BOOKS:

1. Hwei Hsu, "Schaum's Outline of Theory and Problems of Probability, Random Variables and Random Processes ", Tata McGraw Hill Edition, New Delhi, 2004.
2. Miller. S.L. and Childers. D.G., "Probability and Random Processes with Applications to Signal Processing and Communications ", Academic Press, 2004.
3. Stark. H. and Woods. J.W., "Probability and Random Processes with Applications to Signal Processing ", Pearson Education, Asia, 3rd Edition, 2002.

COs	**POs**												**PSOs**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
1	3	3	3	-	-	-	-	-	-	-	-	2	2	-	-
2	3	3	3	-	-	-	-	-	-	-	-	2	2	-	-
3	2	2	2	-	-	-	-	-	-	-	-	2	2	-	-
4	3	3	3	-	-	-	-	-	-	-	-	2	3	-	-
5	2	2	2	-	-	-	-	-	-	-	-	2	3	-	-
6	3	3	2	-	-	-	-	-	-	-	-	2	3	-	-
Overall correlation	3	3	3	-	-	-	-	-	-	-	-	3	3	-	-

23EC401 ELECTROMAGNETIC FIELDS

L	T	P	C
3	0	0	3

COURSE OBJECTIVES:

- To study the basic laws, concepts and proofs related to Electromagnetic Fields
- To impart knowledge on the basics of static electric field and the associated laws
- To impart knowledge on the basics of static magnetic field and the associated laws
- To give insight into coupling between electric and magnetic fields through Faraday's law, displacement current and Maxwell's equations
- To study the significance of time varying EM waves propagating in different media

UNIT I INTRODUCTION 10

Electromagnetic model, Units and constants, Review of vector algebra, Rectangular, cylindrical and spherical coordinate systems, Line, surface and volume integrals, Gradient of a scalar field, Divergence of a vector field, Divergence theorem, Curl of a vector field, Stoke's theorem.

UNIT II ELECTROSTATICS 11

Electric field, Coulomb's law, Gauss's law and applications, Electric potential, Electric flux density and dielectric constant, Boundary conditions, Capacitance – Parallel and cylindrical, Electrostatic energy.

UNIT III MAGNETOSTATICS 9

Lorentz force equation, Ampere's law, Biot-Savart law and applications, Magnetic field intensity and idea of relative permeability, Calculation of magnetic field intensity for various current distributions, Boundary conditions, Inductance and inductors.

UNIT IV MAXWELL's EQUATIONS AND WAVE EQUATIONS 8

Faraday's law, Displacement current and Maxwell-Ampere law, Maxwell's equations, Wave equations and solutions, Observing the Phenomenon of wave propagation with the aid of Maxwell's equations.

UNIT V EM WAVE CHARACTERISTICS 9

Uniform Plane Waves – Definitions, Relation between E & H, Wave Propagation in Lossless Media, Wave Propagation in Good Conductors and Good Dielectrics, Reflection and Refraction of Plane Waves – Normal and Oblique Incidences for both Perfect Conductor and Perfect Dielectrics, Poynting Theorem.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

At the end of the course the students will be able to

CO1: Apply the fundamentals of vector, coordinate system to electromagnetic concepts.

CO2: Make use of the significance of electrostatics in solving electric components of a field.

CO3: Apply the concept of magneto static field in applications of various magnetic materials.

CO4: Analyze the characteristics of electric and magnetic fields at the boundary of two dissimilar media.

CO5: Utilize Faraday's laws and Ampere's laws to observe the phenomenon of wave propagation.

CO6: Make use of the phenomena of wave propagation in different media to estimate power flow at interfaces.

TEXT BOOKS:

1. D.K. Cheng, Field and wave electromagnetics, 2nd ed., Pearson (India), 2002
2. M.N.O.Sadiku and S.V. Kulkarni, Principles of electromagnetics, 6th ed., Oxford(Asian Edition), 2015

REFERENCE BOOKS:

1. Edward C. Jordan & Keith G. Balmain, Electromagnetic waves and Radiating Systems, Second Edition, Prentice-Hall Electrical Engineering Series, 2012.
2. W.H. Hayt and J.A. Buck, Engineering electromagnetics, 7th ed., McGraw-Hill (India), 2006
3. B.M. Notaros, Electromagnetics, Pearson: New Jersey, 2011

COs	**POs**												**PSOs**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
1	3	2	1	1	-	2	1	-	-	1	-	2	2	1	1
2	3	2	3	3	2	2	2	-	-	1	1	2	2	1	1
3	3	2	3	2	2	2	1	-	-	1	1	2	2	1	1
4	3	3	3	2	2	2	1	-	-	1	1	2	2	1	1
5	3	2	3	2	2	2	1	-	-	1	1	2	2	1	1
6	3	2	2	2	2	2	1	-	-	2	2	1	2	1	1
Overall correlation	**3**	**3**	**2**	**2**	**2**	**2**	**1**	**-**	**-**	**1**	**1**	**2**	**2**	**1**	**1**

23EC402 COMMUNICATION SYSTEMS

	L	T	P	C
	3	0	0	3

COURSE OBJECTIVES:

- To introduce analog Modulation Schemes
- To impart knowledge in random process
- To study various Digital techniques
- To introduce the importance of sampling & quantization
- To impart knowledge in demodulation techniques
- To enhance the class room teaching using smart connectivity instruments

UNIT I AMPLITUDE & ANGLE MODULATION 9

Review of signals and systems, Time and Frequency domain representation of signals, Principles of Amplitude Modulation Systems- DSB, SSB and VSB modulations. SSB Generation – Filter and Phase Shift Methods, VSB Generation – Filter Method, Hilbert Transform, Pre-envelope & complex envelope, Angle Modulation, Representation of FM and PM signals, Spectral characteristics of angle modulated signals. Super heterodyne Receiver.

UNIT II RANDOM PROCESS & SAMPLING 9

Review of random process. Gaussian and white noise characteristics, Noise in amplitude modulation systems, Noise in Frequency modulation sys tems. Pre-emphasis and Deemphasis, Threshold effect in angle modulation. Low pass sampling – Aliasing- Signal Reconstruction-Quantization - Uniform & non-uniform quantization - quantization noise - Nyquist criterion- Logarithmic Companding –PAM, PPM, PWM, PCM – TDM, FDM

UNIT III DIGITAL TECHNIQUES 9

Pulse modulation Differential pulse code modulation. Delta modulation, Noise considerations in PCM,, Digital Multiplexers, Channel coding theorem - Linear Block codes - Hamming codes - Cyclic codes - Convolutional codes - Viterbi Decoder

UNIT IV DIGITAL MODULATION SCHEME 9

Geometric Representation of signals - Generation, detection, IQ representation, PSD & BER of Coherent BPSK, BFSK, & QPSK - QAM - Carrier Synchronization - Structure of Non-coherent Receivers Synchronization and Carrier Recovery for Digital modulation, Spectrum Analysis – Occupied bandwidth – Adjacent channel power, Principle of DPSK

UNIT V DEMODULATION TECHNIQUES 9

Elements of Detection Theory, Optimum detection of signals in noise, Coherent communication with waveforms- Probability of Error evaluations. Baseband Pulse Transmission- Inter symbol Interference, Optimum demodulation of digital signals over band-limited channels.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

At the end of the course the students will be able to

CO1: Apply AM, DSB-SC and SSB-SC modulation and calculate the power of AM, DSB-SC and SSB-SC scheme

CO2: Compare the FM and PM generation and analyze the effects of varying frequency deviation on the performance of frequency-modulated signals.

CO3: Summarize the properties of random process, noise characterization and to introduce Analog to Digital Modulation.

CO4: Explain pulse modulation and examine channel coding considering the trade-offs between error correction capabilities and bandwidth utilization

CO5: Explain various digital modulation schemes.

CO6: Summarize the demodulation of digital signals

TEXT BOOKS:

1. Simon Haykins," Communication Systems", Wiley, 5th Edition, 2009.(Unit I - V)
2. B.P.Lathi, "Modern Digital and Analog Communication Systems", 4th Edition, Oxford University Press, 2011.

REFERENCE BOOKS:

1. Wayner Tomasi, Electronic Communication System, 5th Edition, Pearson Education,2008.
2. D.Roody, J.Coolen, Electronic Communications, 4th edition PHI 2006
3. A.Papoulis, "Probability, Random variables and Stochastic Processes", McGraw Hill, 3rd edition, 1991.
4. B.Sklar, "Digital Communications Fundamentals and Applications", 2nd Edition Pearson Education 2007
5. H P Hsu, Schaum Outline Series - "Analog and Digital Communications" TMH 2006
6. Couch.L., "Modern Communication Systems", Pearson, 2001

COs	POs												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	3	2	1	1	-	2	-	-	-	3	-	3	3	-	-
2	3	3	2	2	-	2	1	-	-	3	-	3	2	-	-
3	2	1	-	-	-	2	-	-	-	2	-	2	2	-	-
4	3	3	2	2	-	-	-	-	-	3	-	-	2	-	-
5	2	1	-	-	-	-	1	-	-	2	-	2	2	-	-
6	2	1	-	-	-	-	1	-	-	2	-	-	2	-	-
Overall correlation	3	3	1	1	-	1	1	-	-	3	-	2	3	-	-

23EC403 LINEAR INTEGRATED CIRCUITS

L	T	P	C
3	0	0	3

COURSE OBJECTIVES:

- To introduce the basic building blocks of linear integrated circuits
- To learn the linear and non-linear applications of operational amplifiers
- To introduce the theory and applications of analog multipliers and PLL
- To learn the theory of ADC and DAC
- To introduce the concepts of waveform generation and introduce some special function ICs

UNIT I BASICS OF OPERATIONAL AMPLIFIERS 9

Current mirror and current sources, Current sources as active loads Basic information about op-amps – Ideal Operational Amplifier - General operational amplifier stages -and internal circuit diagrams of IC 741, DC and AC performance characteristics, slew rate, Open and closed loop configurations - Advantages of negative feedback – Voltage / Current, Series, Shunt feedback Amplifiers.

UNIT II APPLICATIONS OF OPERATIONAL AMPLIFIERS 9

Sign Changer, Scale Changer, Phase Shift Circuits, Voltage Follower, V-to-I and I-to-V converters, adder, subtractor, Instrumentation amplifier, Integrator, Differentiator, Logarithmic amplifier, Antilogarithmic amplifier, Comparators, Schmitt trigger, Precision rectifier, peak detector, Low-pass, high-pass and band-pass Butterworth filters

UNIT III ANALOG MULTIPLIER AND PLL 9

Analog Multiplier using Emitter Coupled Transistor Pair - Gilbert Multiplier cell – Variable transconductance technique, analog multiplier ICs and their applications, Operation of the basic PLL, Closed loop analysis, Voltage controlled oscillator, Monolithic PLL IC 565, application of PLL for AM detection, FM detection, FSK modulation and demodulation and Frequency synthesizing and clock synchronization.

UNIT IV ANALOG TO DIGITAL AND DIGITAL TO ANALOG CONVERTERS 9

Analog and Digital Data Conversions, D/A converter – specifications - weighted resistor type, R-2R Ladder type, Voltage Mode and Current-Mode R -2R Ladder types -A/D Converters – specifications - Flash type - Successive Approximation type - Single Slope type – Dual Slope type - A/D Converter using Voltage-to-Time Conversion - Over-sampling A/D Converters- Sigma –Delta Converters.

UNIT V WAVEFORM GENERATORS AND SPECIAL FUNCTION ICS 9

Sine-wave generators – RC and LC oscillators, Multivibrators – Astable and Monostable, ICL8038 function generator, Timer IC 555 – Astable and Monostable operation, IC Voltage regulators – Three terminal fixed and adjustable voltage regulators - IC 723 general purpose regulator - Monolithic switching regulator.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

At the end of the course the students will be able to

CO1: Design linear and nonlinear applications of OP – AMPS.

CO2: Design applications using analog multiplier and PLL.

CO3: Design ADC and DAC using OP – AMPS.

CO4: Generate waveforms using OP – AMP Circuits.

CO5: Analyze special function ICs.

CO6: Develop special function ICs.

TEXT BOOKS:

1. D.Roy Choudhry, Shail Jain, "Linear Integrated Circuits", New Age International Pvt. Ltd.,2018, Fifth Edition. (Unit I – V.
2. Sergio Franco, "Design with Operational Amplifiers and Analog Integrated Circuits", 4th Edition, Tata Mc Graw-Hill, 2016 (Unit I – V)

REFERENCE BOOKS:

1. Ramakant A. Gayakwad, "OP-AMP and Linear ICs", 4th Edition, Prentice Hall / Pearson Education, 2015.
2. Robert F.Coughlin, Frederick F.Driscoll, "Operational Amplifiers and Linear Integrated Circuits", Sixth Edition, PHI, 2001.
3. S.Salivahanan & V.S. Kanchana Bhaskaran, "Linear Integrated Circuits", TMH,2nd Edition, 4th Reprint, 2016.

COs	POs												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	2	3	2	2	-	-	-	-	-	-	-	-	2	-	-
2	3	2	1	1	-	-	-	-	-	-	-	-	3	-	-
3	2	3	2	2	-	-	-	-	-	-	-	-	2	-	-
4	3	2	1	1	-	-	-	-	-	-	-	-	3	-	-
5	2	3	2	2	-	-	-	-	-	-	-	-	2	-	-
6	3	2	1	1	3	-	-	-	-	-	-	-	3	3	-
Overall correlation	3	3	2	2	1	-	-	-	-	-	-	-	3	1	-

23EC421 COMMUNICATION SYSTEMS LABORATORY **L T P C**
0 0 2 4

COURSE OBJECTIVES:

- To study the AM & FM Modulation and Demodulation.
- To learn and realize the effects of sampling and TDM.
- To understand the PCM & Digital Modulation.
- To Simulate Digital Modulation Schemes.
- To Implement Equalization Algorithms and Error Control Coding Schemes.

LIST OF EXPERIMENTS :

1. AM- Modulator and Demodulator
2. FM - Modulator and Demodulator
3. Pre-Emphasis and De-Emphasis.
4. Signal sampling and TDM.
5. Pulse Code Modulation and Demodulation.
6. Pulse Amplitude Modulation and Demodulation.
7. Pulse Position Modulation and Demodulation and Pulse Width Modulation and Demodulation.
8. Digital Modulation – ASK, PSK, FSK.
9. Delta Modulation and Demodulation.
10. Simulation of ASK, FSK, and BPSK Generation and Detection Schemes.
11. Simulation of DPSK, QPSK and QAM Generation and Detection Schemes.

TOTAL : 45 PERIODS

COURSE OUTCOMES:

At the end of the course the students will be able to

CO1: Design AM, FM & Digital Modulators for specific applications.

CO2: Compute the sampling frequency for digital modulation.

CO3: Simulate & validate the various functional modules of Communication system.

CO4: Demonstrate their knowledge in base band signaling schemes through implementation of digital modulation schemes.

CO5: Apply various channel coding schemes & demonstrate their capabilities towards the improvement of the noise performance of Communication system.

CO6: Apply various channel coding schemes & demonstrate their capabilities towards the improvement of the noise performance of Communication system.

COs	POs												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	3	3	3	3	3	3	-	-	-	1	1	1	3	3	3
2	3	3	3	3	3	2	-	-	-	1	1	1	3	3	3
3	3	3	3	3	3	2	-	-	-	1	1	1	3	3	3
4	3	3	3	3	3	3	-	-	-	1	1	1	3	3	3
5	3	3	3	3	3	2	-	-	-	1	1	1	3	3	3
6	3	3	3	3	3	2.5	-	-	-	1	1	1	3	3	3
Overall correlation	3	3	3	3	3	3	-	-	-	1	1	1	3	3	3

23EC422	LINEAR INTEGRATED CIRCUITS LAB	L	T	P	C
		0	0	4	2

COURSE OBJECTIVES:

1. To gain hands on experience in designing electronic circuits
2. To learn simulation software used in circuit design
3. To learn the fundamental principles of amplifier circuits
4. To differentiate feedback amplifiers and oscillators.
5. To differentiate the operation of various multivibrators.

LIST OF EXPERIMENTS :
DESIGN AND ANALYSIS OF THE FOLLOWING CIRCUITS

1. Inverting /Non -Inverting Amplifier
2. RC Phase shift oscillator and Wien Bridge Oscillator
3. Schmitt Trigger
4. RC Integrator and Differentiator circuits using Op-Amp
5. Design Comparator using LM348
6. Active low-pass, High pass & Band pass filters
7. PLL Characteristics and its use as frequency multiplier, clock synchronization
8. R-2R ladder type D-A converter using Op-Amp

SIMULATION USING SPICE (Using Transistor):

1. Inverting /Non -Inverting Amplifier
2. Differentiator/ Integrator
3. Low Pass Filter
4. Schmitt Trigger circuit with Predictable hysteresis
5. Wien Bridge Oscillator

Components and Accessories:

Transistors, Resistors, Capacitors, Inductors, diodes, Zener Diodes, Bread Boards, Transformers.

SPICE Circuit Simulation Software: (any public domain or commercial software)

Note: Op-Amps uA741, LM 301, LM311, LM 324, LM317, LM723, LM 348, 7805, 7812, 2N3524, 2N3525,
2N3391, AD 633, LM 555, LM 565 may be used.

TOTAL : 45 PERIODS

COURSE OUTCOMES:

At the end of the course the students will be able to

CO1: Analyse various types of feedback amplifiers.
CO2: Develop oscillators and wave-shaping circuits.
CO3: Analyse Multivibrator circuits using op-amps.
CO4: Construct various D-A converters using op-amps.
CO5: Examine various filters using op-amps.
CO6: Make use of PSPICE to design and simulate various integrated circuits.

COs	POs												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	2	3	2	2	-	-	-	-	-	-	-	-	2	-	-
2	3	2	1	1	-	-	-	-	-	-	-	-	3	-	-
3	2	3	2	2	-	-	-	-	-	-	-	-	2	-	-
4	3	2	1	1	-	-	-	-	-	-	-	-	3	-	-
5	2	3	2	2	-	-	-	-	-	-	-	-	2	-	-
6	3	2	1	1	3	-	-	-	-	-	-	-	3	3	-
Overall correlation	3	3	2	2	1	-	-	-	-	-	-	-	3	1	-

23ES491 APTITUDE AND LOGICAL REASONING –I

	L	T	P	C
	0	0	2	1

COURSE OBJECTIVES:

- To improve the problem solving and logical thinking ability of the students.
- To acquaint student with frequently asked questions and patterns in quantitative aptitude and logical reasoning.

UNIT I **4**

Numbers, LCM, HCF, Averages, Ratio & Proportion, Mixtures & Allegation.

UNIT II **4**

Percentages, Time and work, Pipes and Cistern, coding and decoding.

UNIT III **4**

Time Speed Distance, Train, Boats and Streams, Analogy.

UNIT IV **4**

Data Interpretation(BAR,PIE,LINE), Seating arrangement.

UNIT V **4**

Simple Interest and Compound Interest, Profit loss and Discount, Partnership.

TOTAL: 20 PERIODS

COURSE OUTCOMES:

At the end of the course the students will be able to

CO 1 Understand the basic concepts of quantitative ability

CO 2 Understand the basic concepts of logical reasoning Skills

CO 3 Increase in critical thinking skills

CO 4 Able to solve campus placements aptitude papers covering Quantitative Ability, Logical Reasoning Ability

TEXT BOOK:

APTIPEDIA, 2nd edition, Wiley Publishers

REFERENCE BOOKS:

1. Quantitative Aptitude – R.S. Agarwal
2. A Modern Approach To Verbal & Non-Verbal Reasoning By R S Agarwal

KCG COLLEGE OF TECHNOLOGY (AUTONOMOUS)
REGULATIONS 2023
B.TECH. FASHION TECHNOLOGY
CHOICE BASED CREDIT SYSTEM
CURRICULUM FOR SEMESTERS I TO VIII

SEMESTER – I

SL NO	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
	23IP101	Induction Programme		-	-	-	-	-
THEORY								
1	23HS101	Essential Communication	HSMC	3	0	0	3	3
2	23MA101	Matrices and Calculus	BSC	3	0	0	3	3
3	23AD101	Programming in Python	ESC	3	0	0	3	3
4	23HS102	Heritage of Tamils	HSMC	1	0	0	1	1
THEORY AND PRACTICALS								
5	23PH111	Engineering Physics	BSC	3	0	2	5	4
6	23CY111	Engineering Chemistry	BSC	3	0	2	5	4
PRACTICALS								
7	23AD121	Python Programming Laboratory	ESC	0	0	4	4	2
8	23HS121	Communication Skills Laboratory	HSMC	0	0	2	2	1
9	23HS122	General Clubs / Technical Clubs / NCC / NSS / Extension Activities	HSMC	0	0	2	2	1*
TOTAL				**16**	**0**	**12**	**28**	**21**

SEMESTER – II

SL NO	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
THEORY								
1	23HS201/ 23HS202	Professional English / Foreign Language	HSMC	3	0	0	3	3
2	23MA203	Statistics and Numerical Methods	BSC	3	1	0	4	4
3	23PH206	Material Science	BSC	3	0	0	3	3
4	23FT201	Introduction to global fashion industry and fashion design	PCC	3	0	0	3	3
5	23HS203	Tamils and Technology	HSMC	1	0	0	1	1
THEORY AND PRACTICALS								
6	23EE282	Basic Electrical, Electronics and Instrumentation Engineering	ESC	2	0	2	4	3
7	23ME211	Engineering Graphics	ESC	3	0	2	5	4
PRACTICALS								
8	23ME221	Engineering Practices Laboratory	ESC	0	0	4	4	2
9	23FT221	Fashion Designing Laboratory	PCC	0	0	4	4	2
10	23HS221	Soft Skills	EEC	0	0	2	2	1*
TOTAL				**18**	**1**	**14**	**33**	**25**

SEMESTER III

SL NO	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
THEORY								
1	23MA304	Probability and Statistical Methods	BSC	4	0	0	4	4
2	23FT301	Technology of Spinning Processes	PCC	3	0	0	3	3
3	23FT302	Garment Construction I	PCC	3	(	0	3	3
4	23HS301	Universal Human Values and Ethics	HSMC	3	0	0	3	3
THEORY AND PRACTICALS								
5	23FT311	Textile Fiber Science and Characteristics	PCC	3	0	2	5	4
6	23FT312	Pattern Engineering	PCC	2	0	4	6	4
PRACTICALS								
7	23FT321	Computer Aided Fashion Designing Laboratory	PCC	0	0	4	4	2
8	23FT322	Garment Components Construction Laboratory	PCC	0	0	4	4	2
9	23ES391	Presentation Skills	EEC	0	0	2	2	1*
TOTAL				**18**	**0**	**16**	**34**	**25**

SEMESTER IV

SL NO	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
THEORY								
1	23CY401	Chemistry for Textile Technologists	BSC	3	0	0	3	3
2	23FT401	Woven Fabric Manufacturing and Structures	PCC	3	1	0	4	4
3	23FT402	Knitted Fabric Manufacturing and Structures	PCC	3	0	0	3	3
4	23FT403	Apparel Machineries and Equipment	PCC	3	0	0	3	3
5		Department Elective - 1	DEC	3	0	0	3	3
6		Department Elective - 2	DEC	3	0	0	3	3
PRACTICALS								
7	23FT421	Fabric Structure Laboratory	PCC	0	0	4	4	2
8	23FT422	Garment Construction Laboratory I	PCC	0	0	4	4	2
9	23ES491	Aptitude and Logical reasoning -1	EEC	0	0	2	2	*1
10	23FT423 / 23FT424	In-plant Training / Mini Project – 1	EEC	0	0	2	2	1
TOTAL				**18**	**1**	**12**	**31**	**24**

SEMESTER V

SL NO	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
THEORY								
1	23RE501	Research Methodology and Intellectual Property Rights	ESC	2	0	0	2	2
2	23FT501	Apparel Marketing and Merchandising	PCC	3	0	0	3	3
3		Department Elective - 3	DEC	3	0	0	3	3
4		Department Elective - 4	DEC	3	0	0	3	3
5		Non-Department Elective - 1 (Emerging Technology)	NEC	3	0	0	3	3
THEORY AND PRACTICALS								
6	23FT511	Textile Chemical Processing	PCC	3	0	2	5	4
PRACTICALS								
7	23FT521	Computer Aided Garment Designing Laboratory	PCC	0	0	4	4	2
8	23FT522	Mini Project – 2	EEC	0	0	4	4	2
9	23ES591	Aptitude and Logical Reasoning -2	EEC	0	0	2	2	*1
TOTAL				**17**	**0**	**12**	**29**	**22**

SEMESTER VI

SL NO	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
THEORY								
1		Department Elective 5	DEC	3	0	0	3	3
2		Department Elective 6	DEC	3	0	0	3	3
3		Non-Department Elective - 2 (Emerging Technology /Safety Courses)	NEC	3	0	0	3	3
THEORY AND PRACTICALS								
4	23CE611	Environmental Sciences and Engineering	ESC	3	0	2	5	4
5	23FT611	Garment Construction II	PCC	2	0	4	6	4
6	23FT612	Fabric and Garment Quality Evaluation	PCC	3	0	2	5	4
PRACTICALS								
7	23FT621	Project Work- Phase 1	EEC	0	0	4	4	2
8	23FT622	Technical Training	EEC	0	0	2	2	1
9	23FT623	Technical Seminar	ESC	0	0	2	2	1
TOTAL				**17**	**0**	**16**	**33**	**25**

SEMESTER VII

SL NO	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
THEORY								
1		Non-Department Elective - 3 (Management Courses)	NEC	3	0	0	3	3
2	23FT701	Apparel Production Planning and Process Control	PCC	3	0	0	3	3
3	23FT702	Fundamentals of Economics and Apparel Costing	PCC	3	0	0	3	3
4	23FT703	Comprehension	EEC	2	0	0	2	2
THEORY AND PRACTICALS								
5	23FT711	Industrial Engineering in Garment Manufacturing	PCC	3	0	2	5	4
PRACTICALS								
6	23FT721	Project work Phase - 2	EEC	0	0	6	6	3
7	23FT722	Industrial Training	EEC	0	0	4	4	2
TOTAL				**14**	**0**	**12**	**26**	**20**

SEMESTER VIII

SL NO	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
PRACTICALS								
1	23FT821/ 23FT822	Internship/Capstone Project	EEC	0	0	20	20	10
TOTAL				**0**	**0**	**20**	**20**	**10**

TOTAL CREDITS: 172

DEPARTMENT ELECTIVE COURSES: VERTICALS

VERTICAL 1: FASHION DESIGNING

SL NO	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1	23FT031	Fashion Evolution	DEC	3	0	0	3	3
2	23FT032	Indian Traditional Textiles and Crafts	DEC	3	0	0	3	3
3	23FT033	Color Science and Psychology	DEC	3	0	0	3	3
4	23FT034	Surface Embellishments	DEC	3	0	0	3	3
5	23FT035	Principles and Elements of Designing	DEC	3	0	0	3	3
6	23FT036	Digital Fashion and Apparel Design	DEC	3	0	0	3	3
7	23FT037	Fashion Communication Design Foundation	DEC	3	0	0	3	3
8	23FT038	Fashion Psychology	DEC	3	0	0	3	3

VERTICAL 2: SUSTAINABLE FASHION PRODUCT DEVELOPMENT

SL NO	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1	23FT039	Clothing Science and Comfort	DEC	3	0	0	3	3
2	23FT040	Fashion Product Development	DEC	3	0	0	3	3
3	23FT041	Garment Finishing and Care	DEC	3	0	0	3	3
4	23FT042	Knit Product Development	DEC	3	0	0	3	3
5	23FT043	Home Furnishing	DEC	3	0	0	3	3
6	23FT044	Apparel Trims, Accessories and Embellishments	DEC	3	0	0	3	3
7	23FT045	Production and Application of Sewing Threads	DEC	3	0	0	3	3
8	23FT046	Sustainable and Eco-fashion	DEC	3	0	0	3	3

VERTICAL 3: TECHNICAL TEXTILES

SL NO	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1	23FT047	Basics of Technical textiles	DEC	3	0	0	3	3
2	23FT048	Coating and laminates	DEC	3	0	0	3	3
3	23FT049	Sustainable Textiles	DEC	3	0	0	3	3
4	23FT050	Medical textiles	DEC	3	0	0	3	3
5	23FT051	Smart and Intelligent Textiles	DEC	3	0	0	3	3
6	23FT052	Sports Textiles	DEC	3	0	0	3	3
7	23FT053	Protective Textiles	DEC	3	0	0	3	3

VERTICAL 4: SPECIALITY APPARELS

SL NO	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1	23FT054	Clothing Science and apparel engineering	DEC	3	0	0	3	3
2	23FT055	Functional Apparels	DEC	3	0	0	3	3
3	23FT056	Manufacturing of Functional Apparels	DEC	3	0	0	3	3
4	23FT057	Intimate Apparels	DEC	3	0	0	3	3
5	23FT058	Denim Processing and Apparels	DEC	3	0	0	3	3
6	23FT059	Leather Garment Technology	DEC	3	0	0	3	3
7	23FT060	Footwear Designing and Technology	DEC	3	0	0	3	3
8	23FT061	Smart wearable	DEC	3	0	0	3	3

VERTICAL 5: APPAREL MARKETING AND RETAIL

SL NO	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1	23FT062	Fashion Forecasting	DEC	3	0	0	3	3
2	23FT063	Visual Merchandising	DEC	3	0	0	3	3
3	23FT064	Apparel Retail Management	DEC	3	0	0	3	3
4	23FT065	Apparel Brand Management	DEC	3	0	0	3	3
5	23FT066	Digital Marketing and E-Business	DEC	3	0	0	3	3
6	23FT067	Fashion Photography	DEC	3	0	0	3	3
7	23FT068	Digital Fashion and Branding	DEC	3	0	0	3	3

VERTICAL 6: APPAREL MANUFACTURING

SL NO	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1	23FT069	Computer Applications in Apparel Manufacturing	DEC	3	0	0	3	3
2	23FT070	Advanced Technologies and Automations for Apparel Industry	DEC	3	0	0	3	3
3	23FT071	Lean Manufacturing	DEC	3	0	0	3	3
4	23FT072	Supply Chain Management for Apparel Industry	DEC	3	0	0	3	3
5	23FT073	Social Compliances and Quality Assurance in Apparel Industry	DEC	3	0	0	3	3
6	23FT074	ERP and MIS in Apparel Industry	DEC	3	0	0	3	3

VERTICAL 7: APPAREL BUSINESS MANAGEMENT

SL NO	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1	23FT075	Entrepreneurship in Apparel Manufacture	DEC	3	0	0	3	3
2	23FT076	Sustainable Apparel Business Management	DEC	3	0	0	3	3
3	23FT077	International Textile and Apparel Business Management	DEC	3	0	0	3	3
4	23FT078	Energy Management in Apparel Industry	DEC	3	0	0	3	3
5	23FT079	Operation Research in Apparel Industry	DEC	3	0	0	3	3
6	23FT080	Human Resource Management	DEC	3	0	0	3	3
7	23FT081	Boutique management	DEC	3	0	0	3	3
8	23FT082	E -commerce business management	DEC	3	0	0	3	3

NON-DEPARMENT ELECTIVE

EMERGING TECHNOLOGY

SL NO	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1	23NE971	Quantum Technology	NEC	3	0	0	3	3
2	23NE972	Block Chain Technology	NEC	3	0	0	3	3
3	23NE973	Artificial Intelligence and Machine Learning Fundamentals	NEC	3	0	0	3	3
4	23NE974	Augmented Reality and Virtual Reality	NEC	3	0	0	3	3
5	23NE975	IoT concepts and applications	NEC	3	0	0	3	3
6	23NE976	Data Science and Fundamentals	NEC	3	0	0	3	3
7	23NE977	Remote Sensing Concepts	NEC	3	0	0	3	3
8	23NE980	Renewable Energy Systems	NEC	3	0	0	3	3
9	23NE981	Integrated Energy Planning for Sustainable Development	NEC	3	0	0	3	3
10	23NE990	Big Data Analytics	NEC	3	0	0	3	3
11	23NE991	Functional Materials	NEC	3	0	0	3	3

MANAGEMENT COURSES

SL NO	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1	23HS971	Total Quality Management	NEC	3	0	0	3	3
2	23HS972	Engineering Economics and Financial Accounting	NEC	3	0	0	3	3
3	23HS973	Engineering Management and Law	NEC	3	0	0	3	3
4	23HS974	Knowledge Management	NEC	3	0	0	3	3
5	23HS975	Industrial Management	NEC	3	0	0	3	3
6	23HS976	Entrepreneurship and Business Opportunities	NEC	3	0	0	3	3
7	23HS977	Modern Business Administration and Financing	NEC	3	0	0	3	3
8	23HS978	Essentials of Management	NEC	3	0	0	3	3

SAFETY COURSES

SL NO	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1	23HS979	Disaster Management	NEC	3	0	0	3	3
2	23HS980	Industrial Safety	NEC	3	0	0	3	3
3	23HS981	Automotive Safety	NEC	3	0	0	3	3

SEMESTER-WISE CREDIT DISTRIBUTION

SEMESTER	HSMC	BSC	ESC	PCC	DEC	NEC	EEC	Total
Semester I	5	11	5					**21**
Semester II	4	7	9	5				**25**
Semester III	3	4		18				**25**
Semester IV		4		13	6		1	**24**
Semester V			2	9	6	3	2	**22**
Semester VI			5	8	6	3	3	**25**
Semester VII			2	10		3	5	**20**
Semester VIII							10	**10**
KCG - FT	**12**	**26**	**23**	**63**	**18**	**9**	**21**	**172**

23MA304 PROBABILITY AND STATISTICAL METHODS

L	T	P	C
4	0	0	4

COURSE OBJECTIVES:

- To develop Probability techniques in manufacturing and quality evaluation process.
- To familiarize the students with two dimensional random variables.
- To familiarize the student with Differential Equations.
- To make the students to understand various techniques of Correlation and Time series Analysis.
- To acquaint the student with mathematical tools needed in evaluating Statistical quality control and to apply in the textile manufacturing industry.

UNIT I PROBABILITY AND RANDOM VARIABLES 12

Probability – axioms of probability – Conditional probability – Baye's theorem - Discrete and continuous random variables – Moments – Moment Generating functions – Binomial, Poisson, Geometric, Uniform distribution (Continuous) , Exponential and Normal distributions.

UNIT II TWO DIMENSIONAL RANDOM VARIABLES 12

Join distributions – Marginal distributions and conditional distributions –Moments - Covariance - Transforms of random variables – Central limit theorem (for independent and identically distributed random variables (without proof)

UNIT III DIFFERENTIAL EQUATIONS 12

Higher order linear differential equations with constant coefficients – Method of variation of parameters – Homogenous equation of Euler's and Legendre's type – System of simultaneous linear differential equations with constant coefficients

UNIT IV CORRELATION, REGRESSION, INDEX NUMBERS AND TIMES SERIES ANALYSIS 12

Correlation analysis, estimation of regression line. Time series analysis: Variations in time series, trend analysis , cyclical variations , seasonal variations and irregular variations. Index Numbers – Lasperyre's, Paasche's and Fisher's Ideal Index.

UNIT V STATISTICAL QUALITY CONTROL 12

Control charts for measurements ($\bar{X}$ and R chart) – Control charts for attributes (p ,C and np) charts – Tolerance limits – acceptance Sampling.

TOTAL: 60 PERIODS

COURSE OUTCOMES:

At the end of the course the students will be able to

CO1: Use the Probability techniques for solving practical problems.

CO2:Analyze standard probability distributions which can describe real life Phenomenon

CO3: Apply two dimensional random variable tools in solving various problems.

CO4: Solve differential Equations by applying various techniques.

CO5: Apply different methods of Correlation, Regression, Index Numbers and Times series analysis in solving practical problems.

CO6: Apply statistical techniques in solving manufacturing and management related problems

TEXT BOOKS:

1. Johnson, R.A., Miller, I and Freund J., "Miller and Freund's Probability and Statistics for Engineers", Pearson Education, Asia, 8th Edition, 2015.
2. Kreyszig.E, "Advanced Engineering Mathematics", John Wiley and Sons, 10 th Edition, New Delhi, 2016.
3. Grewal.B.S., "Higher Engineering Mathematics", Khanna Publishers, New Delhi, 44 th Edition , 2018.
4. Richard I. Levin, David S. Rubin, Sanjay Rastogi Masood Husain Siddiqui, Statistics for Management, Pearson Education, 7th Edition, 2016.

REFERENCE BOOKS:

1. P.Sivaramakrishna Das and C.Vijayakumari "A Text Book on Probability and random variables " Pearson Publications"
2. Devore. J.L., "Probability and Statistics for Engineering and the Sciences", Cengage Learning, New Delhi, 8th Edition, 2014.

COs	POs												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	3	3	1	1	-	-	-	-	-	-	2	3	2	-	-
2	3	3	1	1	-	-	-	-	-	-	2	3	2	-	-
3	3	3	1	1	-	-	-	-	-	-	2	3	2	-	-
4	3	3	1	1	-	-	-	-	-	-	2	3	2	-	-
5	3	3	1	1	-	-	-	-	-	-	2	3	2	-	-
6	3	3	1	1	-	-	-	-	-	-	2	3	2	-	-
Overall correlation	3	3	1	1	-	-	-	-	-	-	2	3	2	-	-

23FT301 TECHNOLOGY OF SPINNING PROCESSES

L	T	P	C
3	0	0	3

COURSE OBJECTIVES:

- To enable the students to understand various processes involved in conversion of fibre into yarn by various spinning system and other modern spinning systems.
- To understand the process of making sewing threads and fibre blends therein.
- To understand the process of yarn and product diversification.

UNIT I OUTLINE & PASSAGE FLOW OF SPINNING PREPARATORY PROCESS **9**

Objectives and working principle of Ginning, Blow room, Carding, Drawing machine, Simplex machine and Combing process and its preparatory process - Superlap.

UNIT II OUTLINE & PASSAGE FLOW OF SPINNING PROCESSES **9**

Ring spinning, Carded yarn process sequence, Combed yarn process sequence, S Twist, Z twist, Doubled yarn, Linear density systems for textile materials;

UNIT III OUTLINE & PASSAGE FLOW OF OPEN-END SPINNING **9**

Principles of yarn formation and material flow – rotor, friction, air-jet and air vortex spinning machines; core, wrap spinning system, comparison of yarn properties

UNIT IV OUTLINE & PASSAGE FLOW OF SEWING THREAD AND SPECIALITY YARNS: **9**

Sewing Thread Manufacture: Fibres used and their characteristics. Essential quality requirements of sewing threads, Sequence of manufacturing process for sewing threads for cotton, polyester and polyester / cotton blends. Speciality Yarns: Fancy yarns, textured yarns and Melange yarns-Types and classifications, application. Core spun yarns.

UNIT V OUTLINE & PASSAGE FLOW OF SPECIALITY SPINNING **9**

Melt spinning, Dry spinning, Sol gel spinning, Hollow spinning, specialized non-circular cross section fibres, spinning for - nonwovens, Optical fibres, thermotropic liquid-crystal polymers, Electro spinning.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

At the end of the course the

CO1: Infer the short staple spinning process and machineries.
CO2: Infer the long staple spinning process and machineries.
CO3: Outline the process of open-end spinning.
CO4: Summarize the spinning concepts in fancy yarns and product diversifications
CO5: Summarize the spinning concepts for product diversifications.
CO6: Outline the process of specialty spinning.

TEXT BOOKS:

1. Lawrence C.A. Advances in Yarn Spinning Technology, Woodhead publishing, 2010
2. Klein W., "The Technology of Short-staple Spinning", The Textile Institute, Manchester,1998.
3. Oxtoby E., “Spun Yarn Technology “, Butterworth, London, 1987, ISBN: 0408014644/ISBN- 13: 9780408014649.
4. Bin Ding, Xianfeng Wang and Jianyong Yu, Electrospinning: Nanofabrication and Applications, Woodhead publishing, 2019

REFERENCE BOOKS:

1. Purushothama, B. Handbook on Cotton Spinning Industry, Woodhead publishing, 2015.
2. Senthil Kumar, R. Process Management in Spinning, CRC Press, 2015.
3. Lord P. R., “Yarn Production: Science, Technology and Economics”, The Textile Institute, Manchester, 2003, ISBN: 1855736969 | ISBN-13: 9781855736962.
4. Salhotra K. R., and Ishtiaque S. M., “Rotor Spinning; its Advantages”, Limitations and Prospects in India, ATIRA, Ahmedabad, 1995

COs	**POs**												**PSOs**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
1	3	-	2	2	-	-	2	1	-	-	3	-	1	1	2
2	3	-	2	2	-	-	2	1	-	-	3	-	1	1	2
3	3	-	2	2	-	-	2	1	-	-	3	-	1	1	2
4	3	-	2	2	-	-	2	1	-	-	3	-	1	1	2
5	3	-	2	2	-	-	2	1	-	-	3	-	1	1	2
6	3	-	2	2	-	-	2	1	-	-	3		1	1	2
Overall correlation	3	-	2	2	-	-	2	1	-	-	3	-	1	2	1

23FT302 GARMENT CONSTRUCTION

L	T	P	C
3	0	0	3

COURSE OBJECTIVES:

- To impart knowledge on fundamentals of garment manufacture.
- To impart knowledge Children wear.

UNIT I APPAREL INDUSTRY PROCESS FLOW **9**

Introduction to Indian apparel industry. Structure of an apparel industry-work flow, Pre production planning; types of samples and sample approval; Technical pack, Specification sheet – preparation, analysis and approval. Preparation of proto pattern and developing production pattern.

UNIT II PATTERN LAYOUT AND CUT ORDER PLANNING **9**

Objectives and requirements of fabric inspection, spreading - modes of spreading, different fabric packages, spreading tension, uniformity and alignment. Importance of grain in garment performance. Principles and types of layout and marker planning - woven fabric lay, knitted fabric lay, types of fabric lay and Marker efficiency. Principles of cutting and cut order plan, bundling and numbering. Control parameters and planning for inspection to numbering.

UNIT III SEAMS AND STITCHES **9**

Stitch types and uses; seam types and uses;. Needle - parts, types and numbers. Selection of needle according to choice of fabric and seam. Characteristics of sewing threads, types and construction. Seam performance. Stitches and seam defects.

UNIT IV TRIMS SELECTION **9**

Types and applications of garment accessories/trims – labels, linnings, inter-linnings, waddings, lace, braid, elastic, hook and loop fasteners, shoulder pads, eyelets, zip fasteners, buttons, rivets.

UNIT V CHILDREN'S WEAR **9**

Fabric selection, drafting procedure and operation breakdown of garment assembly - kids - Top and bottom, rompers, creeper, and jumpsuit.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

At the end of the course the

CO1: Outline the apparel industry process flow.
CO2: Classify the types of lay planning.
CO3: Classify the types of seams and stitches.
CO4: Choose the needle and thread for sewing.
CO5: Interpret trims selection.
CO6: Develop children's wear.

TEXT BOOKS:

1. Harrold Carr., and Barbara Latham., "The Technology of Clothing Manufacture" Backwell Science, U.K., 1994,ISBN: 0632037482 | ISBN-13: 9780632037483.
2. Gerry Cooklin., Steven George Hayes., and John McLoughlin., "Introduction to Clothing Manufacture", Wiley-Blackwell Science, U.K., 2006, ISBN: 0632058463 | ISBN-13:9780632058464.
3. Winifred Aldrich, "Metric Pattern Cutting for Children's Wear and Baby Wear", Blackwell Publishing, 2004.

REFERENCE BOOKS:

1. Richard M. Jones., "The Apparel Industry", Blackwell Science, U.K., 2006, ISBN: 1405135999 |ISBN-13: 9781405135993.
2. Kantilal Ila., "Apparel Industry in India", NICTAS Publication, Ahmedabad, 1990, ISBN:8185472009 | ISBN-13: 9788185472003.
3. Raj kishore Nayak., and Rajiv Pandhya.,"Garment Manufacturing Technology", Woodhead publications 2015, ISBN: 1782422323 | ISBN-13: 9781782422327.
4. ChutterA. J., "Introduction to Clothing Production Management", Wiley-Blackwel Science, U.K., 1995, ISBN: 0632039396 | ISBN-13: 9780632039395.
5. Harold Carr, "The Clothing Factory", Clothing and Footwear Institute, 1972. ISBN: B0012PP566.
6. Miller E., "Textile Properties and Behaviour in Clothing use", Batsford Publication, 1992, ISBN:0713472359 | ISBN-13: 9780713472356.
7. Cooklin G., "Fusing Technology", The Textile Institute, Manchester, 1990, ISBN: 1870812204 |ISBN-13: 9781870812207.
8. Jay Diamond., "Fashion Apparel and Accessories", Delmar Publication, 1994, ISBN: 0827356242 | ISBN-13: 9780827356245.

COs	**POs**												**PSOs**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
1	2	2	2	2	3	-	-	-	1	-	-	3	2	-	2
2	2	2	2	2	3	-	-	-	1	-	-	3	2	-	2
3	2	2	2	2	3	-	-	-	1	-	-	3	2	-	2
4	2	2	2	2	3	-	-	-	1	-	-	3	2	-	2
5	2	2	2	2	3	-	-	-	1	-	-	3	2	-	2
6	2	2	2	2	3	-	-	-	1	-	-	3	2	-	2
Overall Correlation	2	2	2	2	3	-	-	-	1	-	-	3	2	-	2

23HS301 UNIVERSAL HUMAN VALUES AND ETHICS

L	T	P	C
3	0	0	3

COURSE OBJECTIVES:

- Development of a holistic perspective based on self-exploration about themselves (human being), family, society and nature/existence.
- Understanding (or developing clarity) of the harmony in the human being, family, society and nature/existence.
- Strengthening of self-reflection.
- Development of commitment and courage to act.

UNIT I COURSE INTRODUCTION 9

Need, Basic Guidelines, Content and Process for Value Education - Understanding the need, basic guidelines, content and process for Value Education -Self Exploration–what is it? - its content and process; 'Natural Acceptance' and Experiential Validation- as the mechanism for self exploration - Continuous Happiness and Prosperity- A look at basic Human Aspirations -Right understanding, Relationship and Physical Facilities- the basic requirements for fulfilment of aspirations of every human being with their correct priority -Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario -Method to fulfil the above human aspirations: understanding and living in harmony at various levels.

UNIT II UNDERSTANDING HARMONY IN THE HUMAN BEING 9

Harmony in Myself- Understanding human being as a co-existence of the sentient 'I' and the material 'Body' -Understanding the needs of Self ('I') and 'Body' - Sukh and Suvidha- Understanding the Body as an instrument of 'I' (I being the doer, seer and enjoyer) - Understanding the characteristics and activities of 'I' and harmony in 'I' -Understanding the harmony of I with the Body: Sanyam and Swasthya; correct appraisal of Physical needs, meaning of Prosperity.

UNIT III UNDERSTANDING HARMONY IN THE FAMILY AND SOCIETY 9

Harmony in Human-Human Relationship -Understanding Harmony in the family – the basic unit of human interaction -Understanding values in human-human relationship; meaning of Nyaya and program for its fulfilment to ensure satisfaction; Trust(Vishwas) and Respect as the foundational values of relationship -Understanding the meaning of Vishwas; Difference between intention and competence -Understanding the meaning of Samman, Difference between respect and differentiation; the other salient values in relationship -Understanding the harmony in the society (society being an extension of family)-Visualizing a universal harmonious order in society- Undivided Society (Akhand Samaj), Universal Order- from family to world family.

UNIT IV ENGINEERING ETHICS **9**

Senses of ‗Engineering Ethics„ – Variety of moral issues – Types of inquiry – Moral dilemmas – Moral Autonomy – Kohlberg's theory – Gilligan's theory – Consensus and Controversy – Models of professional roles - Theories about right action – Self-interest – Customs and Religion – Uses of Ethical Theories.

UNIT V SAFETY, RESPONSIBILITY AND RIGHTS **9**

Safety and Risk – Assessment of Safety and Risk – Risk Benefit Analysis and Reducing Risk - Respect for Authority – Collective Bargaining – Confidentiality – Conflicts of Interest – Occupational Crime – Professional Rights – Employee Rights – Intellectual Property Rights (IPR) – Discrimination-Moral Leadership –Code of Conduct – Corporate Social Responsibility.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

At the end of the course the students will be able to

CO1: Understand the need of value education.

CO2: Comprehend the difference between self and body.

CO3: Understand the need to exist as an unit of Family and society.

CO4: Understand Harmony at all levels.

CO5: Apply the values acquired in the professional front.

CO6: Identify appropriate technologies for ecofriendly production systems.

TEXT BOOKS:

1. Human Values and Professional Ethics by R R Gaur, R Sangal, G P Bagaria, Excel Books, New Delhi, 2010 3.
2. Mike W. Martin and Roland Schinzinger, ―Ethics in Engineering‖, Tata McGraw Hill, New Delhi, 2003.
3. Govindarajan M, Natarajan S, Senthil Kumar V. S, ―Engineering Ethics‖, Prentice Hall of India, New Delhi, 2004

REFERENCE BOOKS:

1. Jeevan Vidya: Ek Parichaya, A Nagaraj, Jeevan Vidya Prakashan, Amarkantak, 1999.
2. Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004.
3. The Story of Stuff (Book).
4. The Story of My Experiments with Truth - by Mohandas Karamchand Gandhi AICTE Model Curriculum in Humanities, Social Science and Management Courses (UG Engineering & Technology) 169 | Page .
5. Small is Beautiful - E. F Schumacher.
6. Slow is Beautiful - Cecile Andrews.
7. Economy of Permanence - J C Kumarappa 8. Bharat Mein Angreji Raj – Pandit Sunderlal.
8. Rediscovering India - by Dharampal.

9. Hind Swaraj or Indian Home Rule - by Mohandas K. Gandhi .
10. India Wins Freedom - Maulana Abdul Kalam Azad.
11. Vivekananda - Romain Rolland (English) 13. Gandhi - Romain Rolland (English).
12. Charles B. Fleddermann, ―Engineering Ethics‖, Pearson Prentice Hall, New Jersey, 2004.
13. Charles E. Harris, Michael S. Pritchard and Michael J. Rabins, ―Engineering Ethics – Concepts and Cases‖, Cengage Learning, 2009.

WEB SOURCES:

1. www.onlineethics.org
2. www.nspe.org
3. www.globalethics.org

COs	POs												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	-	-	-	-	-	3	3	3	3	3	-	-	-	-	3
2	-	-	-	-	-	3	3	3	3	3	-	-	-	-	3
3	-	-	-	-	-	3	3	3	3	3	-	-	-	-	3
4	-	-	-	-	-	3	3	3	3	3	-	-	-	-	3
5	-	-	-	-	-	3	3	3	3	3	-	-	-	-	3
6	-	-	-	-	-	3	3	3	3	3	-	-	-	-	3
Overall correlation	-	-	-	-	-	3	3	3	3	3	-	-	-	-	3

23FT311 TEXTILE FIBER SCIENCE AND CHARACTERISTICS

L	T	P	C
3	0	2	4

COURSE OBJECTIVES:

- To familiarize the student with the types of fibre and its properties
- To acquaint the student with the physical characteristics of textile fibre

UNIT I INTRODUCTION 9

Definition - staple fibre and filament - monofilament and multifilament, Classificatio natural fibres and man-made fibres, Properties - essential properties and desirable properti Production and cultivation of Natural Fibers: Cotton, Silk, Wool -Physical and chemi structure of the above fibres.

UNIT II REGENERATED AND SYNTHETIC FIBRES 9

Production Sequence of Regenerated Cellulosic fibres - Viscose Rayon. Physical and chemi properties of Viscose Rayon, Acetate rayon and High wet modulus fibres - Modal and Lyoc Tencel. Production Sequence physical and chemical properties of Synthetic Fibers: -Polyest Nylon, Acrylic. Factors to be considered while mixing with natural fibres

UNIT III STRUCTURE AND INVESTIGATION TECHNIQUES OF FIBRES 9

Study of morphological structures of fibers - Transmission and Scanning electr microscopes-principle; construction and working; X-ray diffraction techniques – estimati of crystallinity; Infrared radiation and dichroism techniques.

UNIT IV MOISTURE ABSORPTION, TENSILE AND ELASTIC CHARACTERISTICS OF FIBRES 9

Moisture absorption, Tensile characteristic and Elastic recovery of fibres - Definitio Influence of fibre structure, humidity and temperature. Moisture absorption and rega behavior of natural and man-made fibres; Tensile characteristics –study of streng elongation, work of rupture, initial modulus, work factor and yield point, determination yield point. Elastic recovery behaviour of fibres - Elastic recovery and its relation to stress a strain of fibres; mechanical conditioning of fibres

UNIT V OPTICAL, FRICTIONAL, AND THERMAL CHARACTERISTICS 9

Reflexion and lustre-objective and subjective methods of measurement - refractive index a its measurement - friction – its measurement, comparison of fibres, directional friction in wo – friction. Thermal transitions of fibres - thermal conductivity, thermal expansion a contraction, Tg, melting; static electricity in textile fibres.

TOTAL: 45 PERIODS

LIST OF EXPERIMENTS

1. Identification of natural fibres by burning and microscopic test.
2. Identification of natural fibres by chemical test.
3. Identification of man-made fibres by burning and microscope test.
4. Identification of man-made fibres by chemical test.
5. Identification of regenerative fibres by burning and microscope test.
6. Identification of regnerative fibres by chemical test.
7. Identify the given SEM images of selected fibres.
8. Find out the ply count and fibre/blend composition of sewing thread.
9. Find out the fibre /blend composition of given fabric samples.
10. Collect and find out the GSM of Low, Heavy and Medium fabric samples for different end uses.

TOTAL: 30 PERIODS

COURSE OUTCOMES:

At the end of the course the students will be able to

CO1: Outline the types, classification, properties and production of various fibres.

CO2: Describe the process sequence of various fibres.

CO3: Discuss the structure and morphology of fibres.

CO4: Summarize the moisture, tensile and elastic characteristics.

CO5: Infer the optical and frictional characteristics.

CO6: Explain the thermal characteristics.

TEXT BOOKS:

1. MortonW.E.,andHearleJ.W.S.,"PhysicalPropertiesofTextileFibres",TheTextileInstitute,W ashington D.C., 2008, ISBN978-1-84569-220-95
2. HearleJ.W.S,LomasB.,andCookeW.D.,"AtlasofFibreFractureandDamagetoTextiles", Th Textile Institute, 2nd Edition, 1998, ISBN:1855733196

REFERENCE BOOKS:

1. Meredith R., and Hearle J. W. S., "Physical Methods of Investigation of Textiles", Wil Publication, New York, 1989, ISBN: B00JCV6ZWU ISBN-13:
2. MukhopadhyayS. K., "Advances in Fibre Science", The Textile Institute,19 ISBN:1870812379
3. MeredithR.,"MechanicalPropertiesofTextileFibres",NorthHolland,Amsterdam,1986,ISB N:1114790699, ISBN-13:9781114790698
4. RaheelM. (ed.)., "Modern Textile Characterization Methods", Marcel Dekker, 19 ISBN:0824794737
5. Mukhopadhyay. S. K., "The Structure and Properties of Typical Melt Spun Fibres", Text Progress, Vol. 18, No. 4, Textile Institute, 1989, ISBN:1870812115
6. Hearle J.W.S., "Polymers and Their Properties: Fundamentals of Structures a Mechanics Vol1", EllisHorwood, England, 1982, ISBN:047027302X|ISB 13:9780470273029
7. Greaves. P. H., and Saville B.P., "Microscopy of Textile Fibres", Bios Scientific, U.K., 19

ISBN:1872748244ISBN-13:9781872748245
8. Seville. B. P., "Physical Testing of Textiles", Woodhead Publishing, 1999,ISBN:18557336
| ISBN-13:9781855733671
9. Hearle J. W. S., and Peters. R. H., "Fibre structure", Elsevier Ltd, 1963, ISBN:148321221
ISBN-13:9781483212210

COs	POs												PSOs		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
1	3	-	2	2	1	-	2	1	-	-	3	2	1	2	2
2	3	-	2	2	1	-	2	1	-	-	3	2	1	2	2
3	3	-	2	2	1	-	2	1	-	-	3	2	1	2	2
4	3	-	2	2	1	-	2	1	-	-	3	2	1	2	2
5	3	-	2	2	1	-	2	1	-	-	3	2	1	2	2
6	3	-	2	2	1	-	2	1	-	-	3	2	1	2	2
Overall correlation	3	-	2	2	1	-	2	1	-	-	3	2	1	2	1

23FT312 PATTERN ENGINEERING

L	T	P	C
2	0	4	4

COURSE OBJECTIVES:

- To enhance the fundamental knowledge in human anthropometrics from scientific and technological viewpoint.
- To equip students with comprehensive pattern making skills.

UNIT I STUDY OF BODY MEASUREMENTS AND SIZING SYSTEMS 6

Anthropometry- human anatomy, - Sequence of taking body measurements – landma terms, vertical and horizontal measurements. Industrial sizing system - Principles of sizi system - size categories in children's, women's and men's wear - standard measureme chart.

UNIT II BASICS OF PATTERN MAKING TERMS AND TOOLS 6

Introduction to pattern making and methods - drafting, draping and flat pattern. Bespo method and industrial method. Functions of pattern making tools, pattern maki terminologies - pattern instructions - grain line, dart, fold, pattern number, notches and d hole. Pattern allowance - ease, seam and tolerance.

UNIT III TECHNIQUES OF PATTERN DRAFTING 6

Drafting basic bodice blocks - front and back blocks, block preparation and correction, sk and trouser blocks. Fitting the blocks - necklines, arm hole and sleeve.

UNIT IV PATTERNS FOR COLLARS AND SLEEVES 6

Collar: classification and terms, basic shirt collar, Peter Pan collar, sailor collar, manda collar, built-up neck lines, Cowls

Sleeve: Cap, sleeve cuffs, puff, petal, lantern and leg-of-mutton sleeves.

UNIT V BASICS OF PATTERN ALTERATIONS AND GRADING 6

Pattern alteration for fit, Factors affecting the pattern making process. Contouring Princip Grading process, grade rules, and types of grading system. Principles of grading, gradi techniques - master and basic grading - front, back, sleeve, cuff, collar, pocket, yoke a facing.

TOTAL: 30 PERIODS

<u>LIST OF EXPERIMENTS</u>

1. Drafting and grading of women's basic bodice and sleeves.
2. Drafting of men's basic trousers.
3. Draping of women's bodice and sleeves.
4. Draping of women's trousers.
5. Draping of women's skirt.
6. Drafting of Peter Pan collar and mandarin collar.
7. Drafting of built-up neck lines.

8. Drafting of plain, puff and petal sleeve.
9. Drafting of darts, pleats and tucks.
10. Dart manipulation using slash-spread technique and pivotal transfer technique for bo single dart and two dart series.
11. Parallel and asymmetric darts.
12. Radiating and intersecting darts.
13. Specification sheet interpretation.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

At the end of the course the students will be able to

CO1: Interpret body measurements and sizing system.

CO2: Understand pattern making tools and terms.

CO3: Outline techniques of pattern making.

CO4: Develop patterns for collars, sleeves and plackets.

CO5: Understand pattern alterations and grading concepts.

CO6: Interpret lap planning.

TEXT BOOKS:

1. Harrold Carr., and Barbara Latham., "The Technology of Clothing Manufactur Backwell Science, U.K., 1994,ISBN: 0632037482 | ISBN-13: 9780632037483.
2. Gerry Cooklin., Steven George Hayes., and John McLoughlin., "Introduction Clothing Manufacture", Wiley-Blackwell Science, U.K., 2006, ISBN: 0632058463 | ISB 13:9780632058464.
3. Helen Joseph Armstrong, "Pattern Making for Fashion Design" Pearson Educati (Singapore)Pvt. Ltd.,2005 2. Winifred Aldrich, "Metric Pattern Cutting" Blackw Science Ltd., 1994

REFERENCE BOOKS:

1. Gerry Cooklin, "Master Patterns and Grading for Women's Outsizes", Blackw Scientific Publications, 1995.
2. Gerry Cooklin, "Master Patterns and Grading for Men's Outsize", Blackwell Scient Publications, 1992.
3. Jeenne Price and Bernard Zamkoff, "Grading Techniques for Modern Design" Fairch Publications, 1990.
4. Amaden-Crawford Connie, "The Art of Fashion Draping (3rd edition)" Om Boo International Publications, 2005
5. Winifred Aldrich, "Metric Pattern Cutting" Blackwell Science Ltd., 1994

COs	POs												PSOs		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
1	2	2	2	2	3	-	-	-	1	-	-	3	2	-	2
2	2	2	2	2	3	-	-	-	1	-	-	3	2	-	2
3	2	2	2	2	3	-	-	-	1	-	-	3	2	-	2
4	2	2	2	2	3	-	-	-	1	-	-	3	2	-	2
5	2	2	2	2	3	-	-	-	1	-	-	3	2	-	2
6	2	2	2	2	3	-	-	-	1	-	-	3	2	-	2
Overall correlation	2	2	2	2	3	-	-	-	1	-	-	3	2	-	2

23FT321 COMPUTER AIDED FASHION DESIGNING LABORATORY

L	T	P	C
0	0	2	4

COURSE OBJECTIVES:

- To train the students in CAD used for designing of garments

LIST OF EXPERIMENTS

1. Introduction to tools and workspace of image editing software & vector software
2. Development of motifs suitable for printed textile and woven textile
3. Development of woven fabrics designs – plain, twill, satin and denim
4. Development of technical diagrams –T-shirt and trousers
5. Illustration of Kid's romper (all over print)
6. Illustration of Kid's frock (lace)
7. Illustration of Men's T-shirt with a chest print design
8. Illustration of Men's Basic formal shirt (checks and plaids)
9. Illustration of Men's Basic trouser (solid combos)
10. Illustration of Women's long dress (all over print)
11. Illustration of children's school uniform.
12. Illustration of Women's maternity wear with functionality.

TOTAL: 60 PERIODS

COURSE OUTCOMES:

At the end of the course the students will be able to

CO1 develop textile print design

CO 2 develop fabric design

CO 3 develop technical drawings

CO 4 illustrate different kid's garments

CO 5 Illustrate different men's garments

CO 6 Illustrate different women's garments

COs	POs												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	1	1	1	1	3	-	-	-	2	2	2	3	3	2	3
2	1	1	1	1	3	-	-	-	2	2	2	3	3	2	3
3	1	1	1	1	3	-	-	-	2	2	2	3	3	2	3
4	1	1	1	1	3	-	-	-	2	2	2	3	3	2	3
5	1	1	1	1	3	-	-	-	2	2	2	3	3	2	3
6	1	1	1	1	3	-	-	-	2	2	2	3	3	2	3
Overall correlation	1	1	1	1	3	-	-	-	2	2	2	3	3	2	3

23FT322 GARMENT COMPONENTS CONSTRUCTION LABORATORY

	L	T	P	C
	0	0	2	4

COURSE OBJECTIVES:

- To train the students in fundamentals of garment construction.

LIST OF EXPERIMENTS

1. Study of SNLS and DNLS machines.
2. Preparing samples for stitches – slip basting, running, back, overcasting, hemming a even basting.
3. Preparing samples for seams and seam finishes – Plain seam, double top stitch sea lapped seam, slot seam, French seam, flat felt seam, pinked finish, edge stitched finis
4. Preparing samples for Fullness - Darts, Tucks, Pleats and Gathers.
5. Preparing samples for Necklines – Bias facing, Bias Binding and Fitted facing.
6. Preparing samples for plackets – Continuous Bound Placket, Two Piece Placket, I Opening.
7. Preparing Samples for Sleeves – Plain, Puff at Both Sides, Raglan and Kimono.
8. Preparing samples for collars – Peter Pan collar and Standing collar.
9. Preparing samples for pockets – Patch Pocket, Bound Pocket and Front Hip Pocket.
10. Preparing embroidery stitch samples - running, chain, stem, french knot, bullion kr and lazy daisy.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

At the end of the course the students will be able to

CO1 Prepare samples for seams and stitches.
CO 2 Prepare samples for plackets.
CO 3 Prepare samples for fullness.
CO 4 Prepare samples for necklines.
CO 5 Develop samples in various special machines.
CO6 Develop various garment components.

COs	POs												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	3	2	3	2	2	-	-	-	2	-	2	3	3	3	3
2	3	2	3	2	2	-	-	-	2	-	2	3	3	3	3
3	3	2	3	2	2	-	-	-	2	-	2	3	3	3	3
4	3	2	3	2	2	-	-	-	2	-	2	3	3	3	3
5	3	2	3	2	2	-	-	-	2	-	2	3	3	3	3
6	3	2	3	2	2	-	-	-	2	-	2	3	3	3	3
Overall correlation	3	2	3	2	2	-	-	-	2	-	2	3	3	3	3

23ES391 PRESENTATION SKILLS

	L	T	P	C
	0	0	2	1*

COURSE OBJECTIVES:

- To help learners use brainstorming techniques for generating, organizing and outlining ideas.
- To familiarize learners with different speech structures by engaging them in watching speeches with great opening and closing
- To give practice on voice modulation and use of body language and eye contact for making captivating presentations
- To give hands on training on preparing presentation slides and using remote presentation tools
- To train students on responding to question and feedback with confidence.

UNIT I BRAINSTORMING AND OUTLINING 6

Mind Mapping based on prior knowledge, collecting additional information from external resources, giving prompts to Generative AI tools seeking information, organizing ideas generated, knowing your audience

UNIT II STRUCTURING THE PRESENTATION 6

3 Ts of a presentation, writing effective introduction- Beginning the introduction with a hook (question, data, storytelling) and closing the introduction with the objective of the presentation. Structuring the body paragraphs -Choosing key ideas from the list of ideas generated during brainstorming. Substantiating ideas with examples, data, reasons and anecdotes. Summarizing the ideas for conclusion.

UNIT III DELIVERY TECHNIQUES 6

Vocal variety, intonation, reducing filler words and improving articulation, inflection, engaging the audience. Body language- eye contact, gestures, movement on stage.

UNIT IV USE OF TECHNOLOGICAL AIDS 6

Use of presentation software like MS Power Point, Google Slides etc, incorporating images, graphs, charts and videos, using interactive tools like quizzes and polls, using remote presentation tools like zoom, MS Teams, WebEx for screen sharing, virtual whiteboards and chat functionalities, incorporating AR/VR for more immersive presentations .

UNIT V HANDLING QUESTIONS AND FEEDBACK 6

Audience engagement through questions, PAR (Point, Answer, Redirect) strategy for structuring responses to questions. Understanding feedback process - Receiving, interpreting and evaluating constructively, active listening techniques for processing feedback, responding to feedback- acknowledging, clarifying and appreciating, Dealing with challenging feedback.

TOTAL: 30 PERIODS

COURSE OUTCOMES:

After completion of the course, the students should be able to

CO1 construct ideas for presentation through mind mapping techniques

CO2 organize ideas and structure the presentation with captivating introduction, body paragraphs illustrated with examples and reasons and compelling conclusion

CO3 apply vocal variety and body language techniques to enhance delivery

CO4 prepare engaging presentations by integrating multimedia elements

CO5 demonstrate proficiency in delivering presentations in remote platforms utilizing various technological tools and strategies to engage audience in virtual environments

CO6 exhibit active listening skills by responding to questions with clarity and confidence and incorporating constructive feedback for professional development

TEXT BOOKS:

1. "Slide:ology: The Art and Science of Creating Great Presentations" by Nancy Duarte. O'Reilly Media
2. "The Naked Presenter: Delivering Powerful Presentations With or Without Slides" by Garr Reynolds. New Riders

REFERENCE BOOK:

Talk Like TED: The 9 Public-Speaking Secrets of the World's Top Minds" by Carmine Gallo.

23CY401 CHEMISTRY FOR TEXTILE TECHNOLOGISTS

L	T	P	C
3	0	0	3

COURSE OBJECTIVES:

- Gain proper understanding on spectroscopic and surface analytical techniques.
- Impart knowledge to students on the chemistry of surface and interfaces.
- Make students well versed on the chemical analysis of oils, fats, soaps & lubricants.
- Firmly establish a sound understanding on the student's mind about chemicals andauxiliaries.
- Familiarize students with the identification and characteristics of dyes and theirapplications.

UNIT I SPECTROSCOPIC TECHNIQUES 9

Spectroscopy: Electromagnetic spectrum - absorption of radiation - electronic, vibrational and rotational transitions. Atomic absorption spectroscopy, UV- Vis, IR spectroscopy, Scanning Electron Microscope (SEM) and Transmission Electron Microscope (TEM) - principles, instrumentation (Block diagram) and applications.

UNIT II CHEMISTRY OF INTERFACES 9

Interface region-curved interfaces-thermodynamics of surfaces - Surface film on liquids-Adsorption of gases on Solids-adsorption isotherms – types. Applications of adsorption studies- detergency, wetting, foaming, de foaming, spreading, water repellency.

UNIT III WATER TECHNOLOGY 9

Water: Sources and impurities; Significance and estimation (only mention of methods) of - turbidity, colour, pH, acidity, alkalinity, hardness, DO, BOD, COD. Treatment of water: Zeolites process and ion exchange demineralization; Desalination of water: Reverse osmosis and Electro dialysis; Municipal water treatment: Primary treatment and Disinfection (UV, Ozonation, break-point chlorination).

UNIT IV OILS, FATS, SOAPS, AND LUBRICANTS 9

Chemical constitution, Chemical analysis of oils and fats – acid, saponification and iodine values, Definitions, determinations and significance. Definition, mechanism of lubrication, preparation of petrolubes, desirable characteristics – viscosity, viscosity index, carbon residue, oxidation stability, flash and fire points, cloud and pour points, aniline point. Semisolid lubricant – greases, preparation of sodium, lithium, calcium and axle greases and uses, consistency test and drop point test. Solid lubricants – graphite and molybdenum disulphide.

UNIT V CHEMICALS AND AUXILIARIES 9

Estimation of available chlorine in hypochlorite bleach liquor. Determination of strength of hydrogen peroxide. Colorants - Theory of colour and constitution: chromophore and auxochrome, bathochromic and hypsochromic shift, classification of dyes based on application and composition. Chemistry of azo dye – synthesis of Methyl red, Methyl orange, Congo red, phenolphthalein, fluorescein and eosin, 2D Materials.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

At the end of the course the students will be able to

CO1: Practice and apply spectroscopic techniques for the analysis of engineering materials for their end use applications.

CO2: Extend the applications of adsorption in detergency, wetting, spreading, foaming, de- foaming, and water repellence and separation processes.

CO3: Infer the quality of water from quality parameter data and propose suitable treatment methodologies to treat water.

CO4: Explain the importance of oils, fats, soaps and various lubricants for their intended applications.

CO5: Classify the chemical structures, properties of hypochlorite and Hydrogen peroxide.

CO6: Explain the chemistry of different types of dyes and their applications.

TEXT BOOKS:

1. Dhara S. S., "A Text Book of Engineering Chemistry", 12thEd., S. Chand & Co. Ltd., New Delhi, 2016.
2. Jain. P.C. and Monica Jain, "Engineering Chemistry", Dhanpet Rai & Sons, New Delhi, 17th Edition, 2018.
3. Shikha Agarwal, "Engineering Chemistry-Fundamentals and Applications", Cambridge University Press, Delhi, 2019

REFERENCE BOOKS:

1. B.K. Sharma, "Industrial chemistry", Krishna Prakashan Media (P) Ltd, Meerut, 2014.
2. Shore J., "Colourants and Auxiliaries: 2nd Edition, Volume 1 & 2, Wood head Publishing Ltd., 2002.
3. Shenai V. A., "Chemistry of Dyes and Principles of Dyeing", Sevak Publications, Mumbai, 1995.
4. Trotman E. R., "Dyeing and Chemical Technology of Textile Fibres", B.Y Publishing Pvt. Ltd., New Delhi, 1994.

COs	POs												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	3	2	1	-	-	-	-	2	-	-	-	2	2	-	-
2	3	2	1	-	-	-	-	2	-	-	-	2	3	-	-
3	3	2	1	-	-	-	-	2	-	-	-	2	3	-	-
4	3	2	1	-	-	-	-	2	-	-	-	2	3	-	-
5	3	2	1	-	-	-	-	2	-	-	-	2	3	-	-
6	3	2	1	-	-	-	-	2	-	-	-	2	3	-	-
Overall correlation	3	2	1	-	-	-	-	2	-	-	-	2	3	-	-

23FT401	WOVEN FABRIC MANUFACTURING AND STRUCTURES	L	T	P	C
		3	1	0	4

COURSE OBJECTIVES:

- To familiarize the students with the basics of woven fabric manufacturing and the preparatory processes involved in weaving.
- To make students understand the basics of woven fabric structures and construct the graph designs of simple woven fabric structures.
- To acquaint the students with the mechanisms involved in the motions of power loom weaving.
- To make students aware of the construction of compound woven fabric structures.
- To educate students about the principles of Shuttleless looms, other shedding devices, commercial names and woven fabric defects.

UNIT I BASICS OF WOVEN FABRICS AND PREPARATORY PROCESSES 9+3

Basics of Woven Fabrics and Loom: Different kinds of fabrics, Woven fabrics, Warp, Weft; Motions of Weaving; Loom, Parts of Loom, Path of Warp in Loom; Types of looms.
Winding and Warping Machines: Preparatory processes for single and folded yarn; Objectives of Winding, yarn passage in Cone Winding machine and Pirn Winding machine; Objectives of Warping, warp passage in Back beam warping machine and Sectional warping machine.
Sizing: Objects of sizing, sizing ingredients and their function; Drawing-in, Denting, and Knotting or Piecing; Gaiting.

UNIT II BASICS AND SIMPLE WOVEN FABRIC STRUCTURES 9+3

Basics of Woven Fabric Structures: Principles of constructing Graph Design of Woven Fabric Structures, Principles of deriving Draft and Peg-Plan of given Weave
Basic Weaves: Plain, Twill, Sateen, Warp Rib, Weft Rib, Mat.
Simple Weaves: Wavy Twill, Herring Bone, Diamond, Diaper; Ordinary Honeycomb, Mock-leno, Huck-a-back, Colour and Weave Effect.

UNIT III MECHANISM OF POWER LOOM 9+3

Basics of Power Loom: Basic working principles of Power Loom; Loom Speed and Efficiency.
Motions of Loom: Introduction and objectives of the mechanisms: Tappet Shedding, Over Picking and Under Picking, Crank Beat-up. Warp Let-off, Cloth Take-up, Warp stop, Weft stop, Drop box.
Introduction and objectives of other Shedding Devices: Dobby shedding, Jacquard shedding – mechanical and electronic.

UNIT IV COMPOUND WOVEN FABRIC STRUCTURES 9+3

Compound Weave Structures: Basic construction of – Plain face Bedford cord; Plain face welt; Twill face Warp Backed, and Weft Backed structures.
Plain face Extra Warp, Extra Weft structures produced by heald; Twill face self-stitched Double Cloth; Computer-Aided Graph Designing of Woven Fabric Structures.
Pile Weaves and Leno: Basic construction of - Warp pile-Velvet, 3 Pick -Terry Pile, Weft Pile- Velveteen and Corduroy; Basic Leno structure.

UNIT V SHUTTLELESS LOOM, END USES AND DEFECTS OF WOVEN FABRICS 9+3

Shuttleless Looms: Introduction to weft insertion by Projectile, Single Rapier, Double Rapier, Air jet, and Water jet.
Advancement in weaving: Multiphase weaving, Three Directional and Three-Dimensional weaving
End uses and defects of woven fabrics: End uses of Woven Fabrics; Woven Fabric Defects, Causes and Remedies

TOTAL: 60 PERIODS

COURSE OUTCOMES:

At the end of the course the students will be able to

CO1: Outline the basics of woven fabric manufacturing and the preparatory processes involved in weaving.
CO2: Describe the basics of woven fabric structures and construct the graph designs of simple woven fabric structures.
CO3: Discuss the objectives of the motions of power loom weaving.
CO4: Interpret the construction of compound woven fabric structures.
CO5: Enumerate the introduction to Shuttleless looms and other advancement in weaving.
CO6: Summarize the end uses of woven fabrics; causes, and remedies of woven fabric defects.

TEXT BOOKS:

1. Marks R. and Robinson T.C., “Principles of Weaving”, The Textile Institute, Manchester, 1989, ISBN: 0 900739 258
2. Grosicki Z. J., "Watson's Textile Design and Colour", Vol.1, Woodhead Publications, Cambridge England, 2004, ISBN: 9781782420088

REFERENCE BOOKS:

1. Talukdar M.K., Sriramulu P.K. and Ajgaonkar D.B., “Weaving: Machines, Mechanisms, Management”, Mahajan Publishers, Ahmedabad, 1998, ISBN: 81-85401-16-0
2. Abhijit Majumdar, Principles of Woven Fabric Manufacturing 1st Edition, Kindle Edition ISBN-13 978-1498759113
3. Grosicki Z. J., "Watson's Advanced Textile Design and Colour", Vol.II, Butterworths, London, 1989, ISBN: 9781845698522
4. H. Nisbet, "Grammar of Textile Design", Taraporewala and Sons Co. Pvt. Ltd., 1994, ISBN: 1362902470

COs	**POs**												**PSOs**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
1	3	2	2	1	2	-	-	-	-	1	2	2	3	-	2
2	3	2	2	1	2	-	-	-	-	1	2	2	3	-	2
3	3	2	2	1	2	-	-	-	-	1	2	2	3	-	2
4	3	2	2	1	2	-	-	-	-	1	2	2	3	-	2
5	3	2	2	1	2	-	-	-	-	1	2	2	3	-	2
6	3	2	2	1	2	-	-	-	-	1	2	2	3	-	2
Overall correlation	3	2	2	1	2	-	-	-	-	1	2	2	3	-	2

23FT402	KNITTED FABRIC MANUFACTURING AND STRUCTURES	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To familiarize the students with the fundamentals of knitted fabric manufacturing.
- To make students understand the principles involved in different weft-knitted fabric manufacturing.
- To acquaint the students with the construction of various weft-knit structures.
- To make students aware of the principles involved in different warp-knitted fabric manufacturing and the construction of simple warp-knit structures.
- To educate students about the characteristics and end uses of seamless garments.

UNIT I INTRODUCTION AND FUNDAMENTALS OF KNITTING 9

Reasons for the growth of the knitting industry. Comparison of fabric properties - wovens, knits and bonded fabrics; classification of knitting processes - weft knit & warp knit; yarn quality requirements for knitting. General definitions and principles of knitting; Types of knitting needles - Bearded, Latch & Compound Needle. Elements of knitted loop structure

UNIT II WEFT KNITTING 9

Classification of weft knit structures,- Symbolic and diagrammatic representation of weft knit structures. Comparison of single jersey, rib and interlock and purl structures- comparison knit, tuck, float Stitches–unconventional stitches - Single jersey derivatives, accordion, check and stripe effect.- Rib derivatives derby rib and Swiss rib, royal rib, polka rib- Rib gated structures Milano Rib and Double pique. Commercial weft knitted structures and their end uses.

UNIT III WARP KNITTING 9

Comparison of warp and weft knitting-basic warp knitting elements, knitting cycle- tricot, Rachel machines. Comparison of tricot and Rachel Warp knitting –Basic stitches- pillar, blind lap, tricot, inlay, satin and atlas stitches. – Basic Tricot Warp Knit Structures full tricot, lock knit and loop raised fabrics. Basic Raschel Warp Knit structures- power nets, curtains and laces. – Latest developments in warp knitting machines. - warp knitting calculations for GSM, production. Commercial warp knitted structures and their end uses.

UNIT IV FLAT KNITTING AND JACQUARD KNITTING 9

Basic principles, elements, System of flat machines - Cam plate, yarn carrier sequences, feed machines, knitting needle. Working of V bed flat knitting machine. CAM track - single and multi-track system, function and limitations. Jacquard - Pattern wheel, pattern drum, punched steel tape needle selection mechanism - Electronic Jacquard knitting machines.

UNIT V SEAMLESS GARMENTS **9**

Seamless garments – Introduction, Seamless technique, Common seamless products, Raw materials, Seamless knitting machines, Advantages of seamless garments, Disadvantages of seamless garments, Applications of seamless garments.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

At the end of the course the students will be able to

CO1: Outline the fundamentals of knitted fabric manufacturing.

CO2: Describe the principles involved in different weft-knitted fabric manufacturing.

CO3: Interpret the principles involved in different warp-knitted fabric manufacturing and the construction of warp-knit structures.

CO4: Discuss the principles involved in different flat-knitted fabric manufacturing.

CO5:Enumerate the principles involved in different jacquard-knitted fabric manufacturing.

CO6: Summarize the machines and methods of seamless garments manufacturing.

TEXT BOOKS:

1. Spencer D.J., Knitting Technology, III Ed., Textile Institute, Manchester, 2001, ISBN: 1855733331
2. D J Spencer, Knitting Technology: A Comprehensive Handbook and Practical Guide Woodhead Publishing Series in Textiles, 2001, ISBN 1855733331

REFERENCE BOOKS:

1. Ajgaonkar D.B., "Knitting technology", Universal Publishing Corporation, Mumbai, 1998, ISBN: 0818502738/ISBN: 9780818502736
2. N. Anbumani, Knitting Fundamentals Paperback, New Age International Publisher, 2007, ISBN: 8122419542
3. Samuel Raz., "Flat Knitting: The new generation", Meisenbach GmbH, Bamberg, 1997, ISBN: 3- 87525-054-0.
4. Nonwoven Fabrics: Raw Materials, Manufacture, Applications, Characteristics, Testing Processes, Edited by Wilhelm Albrecht, Hilmar Fuchs, and Walter Kittelmann, WILEY-VCH Verlag GmbH & Co. KGaA, Weinheim, ISBN: 3-527-30406-1, 2003

COs	POs												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	3	2	2	1	2	-	-	-	-	1	2	2	3	-	2
2	3	2	2	1	2	-	-	-	-	1	2	2	3	-	2
3	3	2	2	1	2	-	-	-	-	1	2	2	3	-	2
4	3	2	2	1	2	-	-	-	-	1	2	2	3	-	2
5	3	2	2	1	2	-	-	-	-	1	2	2	3	-	2
6	3	2	2	1	2	-	-	-	-	1	2	2	3	-	2
Overall correlation	3	2	2	1	2	-	-	-	-	1	2	2	3	-	2

23FT403 APPAREL MACHINERIES AND EQUIPMENT

L	T	P	C
3	0	0	3

COURSE OBJECTIVES:

- To impart knowledge on the machineries and equipments used for garme production latest developments in the garment production machineries.

UNIT I SPREADING MACHINES 9

Fabric inspection machines, Types of Fabric Packages. Methods of Fabric spreading. Types of spreading machines – Manual and Computerized spreaders. Limitations and control parameters in spreading. Marker planning, Marker efficiency, Factors affecting marker efficiency.

UNIT II CUTTING MACHINES 9

Introduction to cutting machines. Types and functions of cutting machines – straight knife, round knife, band knife cutting machines. Notches, drills, die cutting machines. Types of Computerized cutting machines and its functional advantages. Maintenance & safety measures of cutting machines.

UNIT III SEWING MACHINES 9

Basic parts of sewing machine –primary and auxiliary parts and their functions. Bobbin case / bobbin hook, throat plate– take up devices – tensioners – feed dog – pressure foot. Types of needles – Parts of needles and their function. Needle finishes and numbers. Adjustments of stand height – pedal – needle bar – stitch length selection – feed timing – needle and bobbin thread tension – stitch cycle timing diagram; Classifications of sewing machines; Basic parts and functions of chain and SNLS sewing machines. Maintenance & safety measures of machines.

UNIT IV MULTI THREAD SEWING MACHINES 9

Over lock machines - Types of over lock machines. Parts and their functions. Threading diagram for overlock machines. Stitch Cycle Diagram for overlock machines – Adjustment of needle height, feed dog height, angle, differential feed ratio, and position of upper and lower knives, Defects and remedies. Flat lock machines – types. Parts and their functions. Threading diagram of flat lock machines – Stitch cycle diagram. Adjustment of parts – needle height, feed dog height, differential feed ratio, loopers. Maintenance & safety measures of machines.

UNIT V SPECIALIZED SEWING MACHINES 9

Special sewing machines – Buttonhole and button sewing machines. Parts and their Functions .threading diagram. Rib cutting machine, zig zag and feed off the arm machine - parts and their functions, threading diagram ; usage of special attachments and tools for operation simplifications. Maintenance & safety measures of machines.

TOTAL:45 PERIODS

COURSE OUTCOMES:

At the end of the course the students will be able to

CO1: Apply different types of fabric laying methods and interpret its effect on spreading

CO2: Classify different types of spreading machines and its control methods.

CO3: Identify different types of cutting machines and its control methods.

CO4: Explain sewing machine and its basic parts, functions and safety measures.

CO5: Interpret different types of multi thread sewing machines and its purpose.

CO6: Identify special sewing machines, its purpose and control measures.

TEXT BOOKS:

1. Harold Carr and Barbara Latham, The Technology of Clothing Manufacture, Om Bo Service, 2002.
2. Shaeffer Claire, Sewing for the Apparel Industry, Prentice Hall, New Jersey, 2001.

REFERENCE BOOKS:

1. Singer, "Sewing Lingerie", Cy DeCosse Incorporated, 1991.
2. Laing R.M. and Webster J, "Stitches and Seams", The Textile Institute, Manchester, 19
3. Technical Advisory Committee of AAMA, "A New Look at Apparel Mechanizatio 1978.
4. Jacob Solinger, Apparel Production Handbook, Reinhold Publications, 1998.

COs	**POs**												**PSOs**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
1	1	3	3	2	2	1	-	-	-	-	-	3	3	3	3
2	1	3	3	2	2	1	-	-	-	-	-	3	3	3	3
3	1	3	3	2	2	1	-	-	-	-	-	3	3	3	3
4	1	3	3	2	2	1	-	-	-	-	-	3	3	3	3
5	1	3	3	2	2	1	-	-	-	-	-	3	3	3	3
6	1	3	3	2	2	1	-	-	-	-	-	3	3	3	3
Overall correlation	1	3	3	2	2	1	-	-	-	-	-	3	3	3	3

23FT421 FABRIC STRUCTURE LABORATORY **L T P C**
0 0 4 2

COURSE OBJECTIVES:

- To train the students in analyzing the cloth to identify construction parameters and structure of woven, knitted and nonwoven fabrics.

LIST OF EXPERIMENTS :

1. Plain and its derivatives
2. Twill and its derivatives
3. Satin & Sateen (Regular and irregular)
4. Honeycomb (ordinary and Brighton)
5. Huck-a-back & Mock-leno
6. Extra warp and extra weft figuring
7. Pile fabrics (warp and weft)
8. Bedford cord & Backed fabrics
9. Gauze and Leno
10. Double cloth
11. Crepe
12. Tapestry
13. Basic Warp knitted and basic Weft knitted structures

TOTAL: 60 PERIODS

COURSE OUTCOMES:

At the end of the course the students will be able to

CO1: Identify the constructional parameters of woven fabric
CO2: Analysis the woven fabric structures
CO3: Analyze the construction of warp knitted structures
CO4: Analyze the construction of Weft knitted structures
CO5: Analyze the structure of nonwoven fabrics
CO6: Analysis of the non-woven structures

COs	POs												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	3	-	3	1	1	1	1	2	3	3	-	1	3	2	2
2	3	-	3	1	1	1	1	2	3	3	-	1	3	2	2
3	3	-	3	1	1	1	1	2	3	3	-	1	3	2	2
4	3	-	3	1	1	1	1	2	3	3	-	1	3	2	2
5	3	-	3	1	1	1	1	2	3	3	-	1	3	2	2
6	3	-	3	1	1	1	1	2	3	3	-	1	3	2	2
Overall correlation	3	-	3	1	1	1	1	2	3	3	-	1	3	2	2

23FT422 **GARMENT CONSTRUCTION LABORATORY I**

L	T	P	C
0	0	4	2

COURSE OBJECTIVES:

- To train the students in garment construction.

LIST OF EXPERIMENTS

1. Study of elastic attachment and feed-of-the-arm machine.
2. Study of overlock and ziz-zag embroidery machine.
3. Designing and developing pattern for Baby Top and Bottom.
4. Construction of Baby Top and Bottom.
5. Designing and developing pattern for Rompers.
6. Construction of Rompers.
7. Designing and Developing Pattern for Men's Shirt.
8. Construction of Men's Shirt.
9. Designing and Developing Pattern for Women's Skirt.
10. Construction of Women's Skirt
11. Grading of Men's Shirt and Women's skirt.

TOTAL: 60 PERIODS

COURSE OUTCOMES:

At the end of the course, the student would be able to

CO1: Develop samples in various special machines.
CO2: Develop patterns for various children's, women's and men's garments.
CO3: Construct various children's garments.
CO4: Construct various women's garments.
CO5: Construct various men's garments.
CO6: Develop grading for children's, women's and men's garments.

COs	POs												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	3	-	3	1	1	1	1	2	3	3	-	1	3	2	2
2	3	-	3	1	1	1	1	2	3	3	-	1	3	2	2
3	3	-	3	1	1	1	1	2	3	3	-	1	3	2	2
4	3	-	3	1	1	1	1	2	3	3	-	1	3	2	2
5	3	-	3	1	1	1	1	2	3	3	-	1	3	2	2
6	3	-	3	1	1	1	1	2	3	3	-	1	3	2	2
Overall correlation	3	-	3	1	1	1	1	2	3	3	-	1	3	2	2

23ES491 APTITUDE AND LOGICAL REASONING –I

	L	T	P	C
	0	0	2	1

COURSE OBJECTIVES:

- To improve the problem solving and logical thinking ability of the students.
- To acquaint student with frequently asked questions and patterns in quantitative aptitude and logical reasoning.

UNIT I **4**

Numbers, LCM, HCF, Averages, Ratio & Proportion, Mixtures & Allegation.

UNIT II **4**

Percentages, Time and work, Pipes and Cistern, coding and decoding

UNIT III **4**

Time Speed Distance, Train, Boats and Streams, Analogy

UNIT IV **4**

Data Interpretation(BAR,PIE,LINE), Seating arrangement

UNIT V **4**

Simple Interest and Compound Interest, Profit loss and Discount, Partnership,

TOTAL: 20 PERIODS

COURSE OUTCOMES:

At the end of the course the students will be able to

CO 1 Understand the basic concepts of quantitative ability

CO 2 Understand the basic concepts of logical reasoning Skills

CO 3 Increase in critical thinking skills

CO 4 Able to solve campus placements aptitude papers covering Quantitative Ability, Logical Reasoning Ability

TEXT BOOK:

APTIPEDIA, 2nd edition, Wiley Publishers

REFERENCE BOOKS:

1. Quantitative Aptitude – R.S. Agarwal
2. A Modern Approach To Verbal & Non-Verbal Reasoning By R S Agarwal

KCG COLLEGE OF TECHNOLOGY (AUTONOMOUS)
REGULATIONS 2023
B.TECH. INFORMATION TECHNOLOGY
CHOICE BASED CREDIT SYSTEM
CURRICULUM FOR SEMESTERS I TO VIII

SEMESTER – I

SL. NO	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
	23IP101	Induction Programme		-	-	-	-	-
THEORY								
1	23HS101	Essential Communication	HSMC	3	0	0	3	3
2	23MA101	Matrices and Calculus	BSC	3	0	0	3	3
3	23CS101	Programming in C	ESC	3	0	0	3	3
4	23HS102	Heritage of Tamils	HSMC	1	0	0	1	1
THEORY AND PRACTICALS								
5	23PH111	Engineering Physics	BSC	3	0	2	5	4
6	23CY111	Engineering Chemistry	BSC	3	0	2	5	4
PRACTICALS								
7	23CS121	C Programming Laboratory	ESC	0	0	4	4	2
8	23HS121	Communication Skills Laboratory	HSMC	0	0	2	2	1
9	23IT121	Information Technology Essentials	ESC	0	0	2	2	1
10	23HS122	General Clubs / Technical Clubs / NCC / NSS / Extension Activities	HSMC	0	0	2	2	1*
TOTAL				**16**	**0**	**14**	**30**	**22**

SEMESTER – II

SL. NO	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
THEORY								
1	23HS201/ 23HS202	Professional English / Foreign Language	HSMC	3	0	0	3	3
2	23MA204	Probability and Statistics	BSC	3	1	0	4	4
3	23PH205	Physics for Information Science	BSC	3	0	0	3	3
4	23IT201	Data Structures and Algorithms	PCC	3	0	0	3	3
5	23HS203	Tamils and Technology	HSMC	1	0	0	1	1
THEORY AND PRACTICALS								
6	23EE281	Basic Electrical and Electronics Engineering	ESC	2	0	2	4	3
7	23ME211	Engineering Graphics	ESC	3	0	2	5	4
PRACTICALS								
8	23ME221	Engineering Practices Laboratory	ESC	0	0	4	4	2
9	23IT221	Data Structures and Algorithms Laboratory	PCC	0	0	4	4	2
10	23ES291	Soft Skills	EEC	0	0	2	2	1*
TOTAL				**18**	**1**	**14**	**33**	**25**

SEMESTER – III

SL. NO	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK L	T	P	TOTAL CONTACT PERIODS	CREDITS
THEORY								
1	23MA202	Discrete Mathematics	BSC	3	1	0	4	4
2	23IT301	Java Programming	PCC	3	0	0	3	3
3	23CS302	Database Management Systems	PCC	3	0	0	3	3
4	23HS301	Universal Human Values and Ethics	HSMC	3	0	0	3	3
THEORY AND PRACTICALS								
5	**23CS311**	Digital Principles and System Design	PCC	3	0	2	5	4
6	23IT311	Advanced Algorithms	PCC	3	0	2	5	4
PRACTICALS								
7	23IT321	Java Programming Laboratory	PCC	0	0	4	4	2
8	23CS322	Database Management Systems Laboratory	PCC	0	0	4	4	2
9	23ES391	Presentation Skills	EEC	0	0	2	2	1*
TOTAL				**18**	**1**	**14**	**33**	**25**

SEMESTER – IV

SL. NO	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK L	T	P	TOTAL CONTACT PERIODS	CREDITS
THEORY								
1	23MA301	Linear Algebra	BSC	3	1	0	4	4
2	23IT401	Machine Learning	PCC	3	0	0	3	3
3	23CS401	Operating Systems	PCC	3	0	0	3	3
4	23IT402	Formal Languages and Automata Theory	PCC	3	0	0	3	3
5	23IT403	Computer Organization and Architecture	PCC	3	0	0	3	3
THEORY AND PRACTICALS								
6	23IT411	Web Technology	PCC	3	0	2	5	4
PRACTICALS								
7	23IT421	Machine Learning Laboratory	PCC	0	0	4	4	2
8	23CS421	Operating Systems Laboratory	PCC	0	0	4	4	2
9	23ES491	Aptitude and Logical Reasoning -1	EEC	0	0	2	2	1*
10	23IT422	Mini Project – 1	EEC	0	0	2	2	1
TOTAL				**18**	**1**	**14**	**33**	**25**

SEMESTER – V

SL. NO	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
THEORY								
1	23RE501	Research Methodology and Intellectual Property Rights	ESC	2	0	0	2	2
2	23IT501	Data Communications and Networks	PCC	3	0	0	3	3
3		Department Elective -1	DEC	3	0	0	3	3
4		Department Elective - 2	DEC	3	0	0	3	3
5		Non-Department Elective - 1 (Emerging Technology)	NEC	3	0	0	3	3
THEORY AND PRACTICALS								
6	23IT511	Object Oriented Software Engineering	PCC	3	0	2	5	4
PRACTICALS								
7	23IT521	Data Communications and Networks Laboratory	PCC	0	0	4	4	2
8	23IT522	Mini Project – 2	EEC	0	0	4	4	2
9	23ES591	Aptitude and Logical Reasoning – 2	EEC	0	0	2	2	1*
TOTAL				**17**	**0**	**12**	**29**	**22**

SEMESTER – VI

SL. NO	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
THEORY								
1	23IT601	Cryptography and Network Security	PCC	3	0	0	3	3
2		Department Elective - 3	DEC	3	0	0	3	3
3		Department Elective - 4	DEC	3	0	0	3	3
4		Non-Department Elective - 2 (Management / Safety Courses)	NEC	3	0	0	3	3
THEORY AND PRACTICALS								
6	23CE611	Environmental Sciences and Engineering	ESC	3	0	2	5	4
5	23IT611	Embedded Systems and IoT	PCC	3	0	2	5	4
PRACTICALS								
7	23IT621	Project Work - Phase 1	EEC	0	0	4	4	2
8	23IT622	Technical Training	EEC	0	0	2	2	1
9	23IT623	Technical Seminar – 1	ESC	0	0	2	2	1
TOTAL				**18**	**0**	**12**	**30**	**24**

SEMESTER – VII

SL. NO	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
THEORY								
1		Non-Department Elective - 3 (Management Courses)	NEC	3	0	0	3	3
2		Department Elective – 5	DEC	3	0	0	3	3
3		Department Elective – 6	DEC	3	0	0	3	3
4	23IT701	Comprehension	EEC	2	0	0	2	2
THEORY AND PRACTICALS								
5	23IT711	Software Project Management and Testing	PCC	3	0	2	5	4
PRACTICALS								
6	23IT721	Project Work - Phase 2	EEC	0	0	6	6	3
7	23IT722	Technical Seminar – 2	ESC	0	0	4	4	2
TOTAL				**14**	**0**	**12**	**26**	**20**

SEMESTER – VIII

SL. NO	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
PRACTICALS								
1	23IT821/ 23IT822	Internship / Capstone Project	EEC	0	0	20	20	10
TOTAL				**0**	**0**	**20**	**20**	**10**

TOTAL CREDITS: 173

DEPARTMENT ELECTIVE COURSES

VERTICAL 1: CLOUD COMPUTING

SL. NO	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1	23IT031	Distributed and Cloud Computing	DEC	2	0	2	4	3
2	23IT032	Cloud Services Management	DEC	2	0	2	4	3
3	23IT033	Virtualization	DEC	2	0	2	4	3
4	23IT034	Cloud Database Management	DEC	2	0	2	4	3
5	23IT035	Storage Technologies	DEC	2	0	2	4	3
6	23IT036	Security and Privacy in Cloud	DEC	2	0	2	4	3
7	23IT037	Stream Processing	DEC	2	0	2	4	3
8	23IT038	GDP and Cloud Web Services	DEC	2	0	2	4	3

VERTICAL 2: FULL STACK DEVELOPMENT

SL. NO	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1	23CS031	Java Full Stack Development	DEC	2	0	2	4	3
2	23CS032	Mobile App Development	DEC	2	0	2	4	3
3	23CS033	UI and UX Design	DEC	2	0	2	4	3
4	23CS034	MERN Stack Web Development	DEC	2	0	2	4	3
5	23CS035	DevOps	DEC	2	0	2	4	3
6	23CS036	Cognitive Systems	DEC	2	0	2	4	3
7	23CS037	Advanced Java Programming	DEC	2	0	2	4	3
8	23CS038	Python Full Stack Development	DEC	2	0	2	4	3

VERTICAL 3: ARTIFICIAL INTELLIGENCE AND DATA SCIENCE

SL. NO	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1	23IT039	Knowledge Engineering	DEC	3	0	0	3	3
2	23IT040	Introduction to Data Science	DEC	3	0	0	3	3
3	23IT041	Neural Networks and Deep Learning	DEC	3	0	0	3	3
4	23IT042	Natural Language Processing in AI	DEC	3	0	0	3	3
5	23IT043	Principle practices of AI	DEC	3	0	0	3	3
6	23IT044	Big Data Analytics	DEC	3	0	0	3	3
7	23IT045	Data Mining and Warehousing	DEC	3	0	0	3	3
8	23AD049	Ethics of AI	DEC	3	0	0	3	3

VERTICAL 4: NETWORK & SECURITY

SL. NO	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1	23CB031	Ethical Hacking	DEC	3	0	0	3	3
2	23CB032	Digital and Mobile Forensics	DEC	3	0	0	3	3
3	23CB033	Social Network Security	DEC	3	0	0	3	3
4	23CS039	Information Security	DEC	3	0	0	3	3
5	23CS040	High Performance Networks	DEC	3	0	0	3	3
6	23CS041	Crypto currency and Blockchain Technology	DEC	3	0	0	3	3
7	23CS042	Protocols and Architectures for Wireless Sensor Networks	DEC	3	0	0	3	3
8	23CS043	Mobile and Pervasive Computing	DEC	3	0	0	3	3

VERTICAL 5: SOFTWARE ENGINEERING

SL. NO	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1	23IT046	Software Design	DEC	3	0	0	3	3
2	23IT047	Software Documentation	DEC	3	0	0	3	3
3	23IT048	Human Computer Interface	DEC	3	0	0	3	3
4	23IT049	Software Quality Assurance	DEC	3	0	0	3	3
5	23IT050	Agile Methodology	DEC	3	0	0	3	3
6	23IT051	Software Requirements Engineering	DEC	3	0	0	3	3
7	23IT052	Software Reliability Metrics and Models	DEC	3	0	0	3	3
8	23IT053	Software Architecture	DEC	3	0	0	3	3

NON-DEPARMENT ELECTIVE

EMERGING TECHNOLOGY

SL NO	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1	23NE980	Renewable Energy Systems	NEC	3	0	0	3	3
2	23NE982	Resource Management Techniques	NEC	3	0	0	3	3
3	23NE983	Aviation Management	NEC	3	0	0	3	3
4	23NE984	Quality Engineering	NEC	3	0	0	3	3
5	23NE986	Foundation of Robotics	NEC	3	0	0	3	3
6	23NE987	Space Engineering	NEC	3	0	0	3	3
7	23NE989	Wearable Devices	NEC	3	0	0	3	3

MANAGEMENT COURSES

SL NO	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1	23HS971	Total Quality Management	NEC	3	0	0	3	3
2	23HS972	Engineering Economics and Financial Accounting	NEC	3	0	0	3	3
3	23HS973	Engineering Management and Law	NEC	3	0	0	3	3
4	23HS974	Knowledge Management	NEC	3	0	0	3	3
5	23HS975	Industrial Management	NEC	3	0	0	3	3
6	23HS976	Entrepreneurship and Business Opportunities	NEC	3	0	0	3	3
7	23HS977	Modern Business Administration and Financing	NEC	3	0	0	3	3
8	23HS978	Essentials of Management	NEC	3	0	0	3	3

SAFETY COURSES

SL NO	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1	23HS979	Disaster Management	NEC	3	0	0	3	3
2	23HS980	Industrial Safety	NEC	3	0	0	3	3
3	23HS981	Automotive Safety	NEC	3	0	0	3	3

SEMESTER-WISE CREDIT DISTRIBUTION

SEMESTER	HSMC	BSC	ESC	PCC	DEC	NEC	EEC	Total
Semester I	5	11	6					22
Semester II	4	7	9	5				25
Semester III	3	4		18				25
Semester IV		4		20			1	25
Semester V			2	9	6	3	2	22
Semester VI			5	7	6	3	3	24
Semester VII			2	4	6	3	5	20
Semester VIII							10	10
Total - Curriculum- IT	12	26	24	63	18	9	21	173

23MA202 DISCRETE MATHEMATICS

	L	T	P	C
	3	1	0	4

COURSE OBJECTIVES:

- To develop student‘s logical and mathematical maturity and ability to deal with abstraction.
- To introduce most of the basic terminologies used in computer science related courses and application of ideas to solve practical problems.
- To understand the basic concepts of combinatorics and graph theory.
- To familiarize the applications of algebraic structures.
- To understand the concepts and significance of Lattices and Boolean algebra which are widely used in computer science and engineering.

UNIT I LOGIC AND PROOFS 9+3

Propositional logic – Propositional equivalences - Predicates and quantifiers – Nested quantifiers – Rules of inference - Introduction to proofs – Proof methods and strategy

UNIT II COMBINATORICS 9+3

Mathematical induction - The basics of counting - Well ordering -Strong induction – The pigeonhole principle – Permutations and Combinations – Recurrence relations - Solving linear recurrence relations – Generating functions – Inclusion and exclusion principle and its applications.

UNIT III GRAPHS 9+3

Graphs and graph models – Graph terminology and special types of graphs – Matrix representation of graphs and graph isomorphism – Connectivity – Euler and Hamilton paths.

UNIT IV LATTICES AND BOOLEAN ALGEBRA 9+3

Algebraic systems – Semi groups and monoids - Groups – Subgroups – Homomorphism‘s – Normal subgroup and cosets – Lagrange‘s theorem – Definitions and examples of Rings and Fields.

UNIT V Z-TRANSFORMS AND DIFFERENCE EQUATIONS 9+3

Partial ordering – Posets – Lattices as posets – Properties of lattices - Lattices as algebraic systems – Sub lattices – Direct product and homomorphism – Some special lattices – Boolean algebra – Boolean Homomorphism.

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TOTAL: 60 PERIODS

COURSE OUTCOMES:

At the end of the course the students will be able to

CO1: Apply the concepts of propositional and predicate calculus to the given logical statements needed for computing skill

CO2: Apply the idea of mathematical induction, pigeon-hole principle, inclusion and exclusion principle, permutation and combinations, recurrence relations and generating functions in combinatorial problems

CO3: Analyze the solutions for various engineering problems using graphs

CO4: Apply the concepts and properties of algebraic structures such as semi groups, monoids and groups needed in areas like formal languages and design fast adders, error-detecting codes and error-correcting codes

CO5: Identify the lattice structure using its properties

CO6: Apply Boolean expressions in areas like computational theory.

TEXT BOOKS:

1. Rosen. K.H., "Discrete Mathematics and its Applications", 7th edition, Tata McGraw Hill Pub. Co. Ltd., New Delhi, Special Indian Edition, 2017.
2. Tremblay. J.P. and Manohar. R, "Discrete Mathematical Structures with Applications to Computer Science", Tata McGraw Hill Pub. Co. Ltd, New Delhi, 30th Reprint, 2011.

REFERENCE BOOKS:

1. Dr.P.Sivaramakrishnadas, Dr.C.Vijayakumari, 'Discrete Mathematics' Pearson Publications
2. Grimaldi. R.P. "Discrete and Combinatorial Mathematics: An Applied Introduction", 5thEdition, Pearson Education Asia, Delhi, 2013.
3. Koshy. T. "Discrete Mathematics with Applications", Elsevier Publications, 2006.
4. Lipschutz. S. and Mark Lipson., "Discrete Mathematics", Schaum's Outlines, Tata McGraw Hill Pub. Co. Ltd., New Delhi, 3rd Edition, 2010.

COs	POs												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	3	2	1	-	-	-	-	-	-	-	-	-	3	-	-
2	3	2	2	-	-	-	-	-	-	-	-	-	3	-	-
3	3	3	2	-	-	-	-	-	-	-	-	-	3	-	-
4	3	2	1	-	-	-	-	-	-	-	-	-	3	-	-
5	3	2	1	-	-	-	-	-	-	-	-	-	3	-	-
6	3	2	1	-	-	-	-	-	-	-	-	-	3	-	-
Overall correlation	**3**	**3**	**2**	-	-	-	-	-	-	-	-	-	**3**	-	-

23IT301 JAVA PROGRAMMING

	L	T	P	C
	3	0	0	3

COURSE OBJECTIVES:

- To explain object oriented principles like abstraction, encapsulation, inheritance, and polymorphism and apply them for solving problems.
- To explain the principles of inheritance and polymorphism and demonstrate how they relate to the design of abstract classes.
- To explain the implementation of packages and interfaces.
- To explain the concepts of exception handling, multithreading and collection classes.
- To explain how to connect to the database using JDBC.
- To explain the design of Graphical User Interface using applets and swing controls.

UNIT I INTRODUCTION TO JAVA PROGRAMMING 9

Java Programming - Java Buzz words, Data types, variables, Constants, Scope and Lifetime of variables, Operators, Type conversion and casting, Enumerated types, Control flow- block scope, conditional statements, loops, break and continue statements, arrays, simple java standalone programs, class, object, and its methods constructors, methods, static fields and methods, access control, this reference, overloading constructors, recursion, exploring string class, garbage collection.

UNIT II INHERITANCE AND INTERFACE 9

Inheritance – Inheritance types, super keyword, preventing inheritance: final classes and methods. Polymorphism – method overloading and method overriding, abstract classes and methods. Interfaces- Interfaces Vs Abstract classes, defining an interface, implement interfaces, accessing implementations through interface references, extending interface, inner class. Packages- Defining, creating and accessing a package, importing packages.

UNIT III EXCEPTION HANDLING AND MULTI THREADING 9

Exception handling-Benefits of exception handling, the classification of exceptions - exception hierarchy, checked exceptions and unchecked exceptions, usage of try, catch, throw, throws and finally, creating own exception subclasses. Multithreading – Differences between multiple processes and multiple threads, thread life cycle, creating threads, interrupting threads, thread priorities, synchronizing threads, inter-thread communication, producer consumer problem.

UNIT IV COLLECTION FRAMEWORK, I/O, GENERIC PROGRAMMING 9

Collection Framework in Java – Introduction to java collections, Overview of java collection framework, commonly used collection classes- Array List, Vector, Hash table, Stack, Lambda Expressions. Files- Streams- Byte streams, Character streams, Text input/output, Binary input/output, File management using File class. Generic Programming – Generic classes – generic methods.

UNIT V EVENT HANDLING PROGRAMMING 9

Hierarchy for Swing components, Overview of some Swing components – Jbutton, JLabel, JTextField, JTextArea, simple Swing applications, Layout management – Layout manager types – border, grid and flow. Event Handling- Events, Event sources, Event classes, Event Listeners, Delegation event model, Examples: Handling Mouse and Key events, Adapter classes

TOTAL: 45 PERIODS

COURSE OUTCOMES:

At the end of the course the

CO1: Apply the concepts of classes and objects to solve simple problems.
CO2: Identify relationships among classes needed for a specific problem with interfaces and inheritance.
CO3: Illustrate error handling techniques using exception handling and multithreading.
CO4: Develop a Java programs with the concepts of a hierarchy of Java collection framework.
CO5: Illustrate I/O streams and Generic programming to provide a solution to a given set of requirements.
CO6: Demonstrate the ability to employ various types of event handling using swing.

TEXT BOOKS:

1. Herbert Schildt, "Java: The Complete Reference", 11 th Edition, McGraw Hill Education, New Delhi, 2019
2. Herbert Schildt, "Introducing JavaFX 8 Programming", 1 st Edition, McGraw Hill Education, New Delhi, 2015

REFERENCE BOOK:

1. Paul Deitel, Harvey Deitel, "Java SE 8 for programmers", 3rd Edition, Pearson, 2015.
2. E. Balagurusamy , "Programming with Java", 7th Edition, Mc Grow Hill, 2023
3. Cay S. Horstmann, "Core Java Fundamentals", Volume 1, 11th Edition, Prentice Hall, 2018.
4. R . Nageswara Rao, "Core Java: An Integrated Approach", Dreamtech Press. 2016.

COs	**POs**												**PSOs**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
1	3	2	1	-	-	-	-	1	-	-	-	1	2	2	2
2	3	2	1	-	-	-	-	1	1	1	-	1	3	3	2
3	3	2	1	-	-	-	-	1	1	1	-	1	2	2	3
4	3	2	1	1	1	-	-	1	1	1	-	1	3	3	2
5	3	2	1	1	1	-	-	1	1	1	-	1	2	3	3
6	3	2	1	1	1	-	-	1	1	1	-	1	2	2	2
Overall correlation	3	2	1	1	1	-	-	2		1	-	-	3	3	3

23CS302 DATABASE MANAGEMENT SYSTEMS

	L	T	P	C
	3	0	0	3

COURSE OBJECTIVES:

- To learn the fundamentals of data models, conceptualize and depict a database system using ER diagram.
- To study the principles to be followed to create an effective relational database and write SQL queries to store/retrieve data to/from database systems.
- To know the fundamental concepts of transaction processing, concurrency control techniques and recovery procedure.
- To learn about the internal storage structures using different file and indexing techniques and the basics of query processing and optimization.
- To study the basics of distributed databases, semi-structured and un-structured data models.

UNIT I RELATIONAL DATABASES 9

Purpose of Database System – Views of Data – Data Models – Database System Architecture – Introduction to Relational Databases – Relational Model – Keys – Relational Algebra – Relational Calculus – SQL Fundamentals – Advanced SQL features – Triggers – Embedded SQL

UNIT II DATABASE DESIGN 9

Mapping Entity-Relationship Model – ER Diagrams – Functional Dependencies – Non-Loss Decomposition Functional Dependencies – First Normal Form – Second Normal Form – Third Normal Form – Dependency Preservation – Boyce/Codd Normal Form – Multi-Valued Dependencies and Fourth Normal Form – Join Dependencies and Fifth Normal Form.

UNIT III TRANSACTION MANAGEMENT 9

Transaction Concepts – ACID Properties – Serializability – Transaction Isolation Levels – Concurrency Control – Need for Concurrency – Lock-Based Protocols – Deadlock Handling -Recovery System – Failure Classification – Recovery Algorithm.

UNIT IV IMPLEMENTATION TECHNIQUES 9

Overview of Physical Storage Media – RAID – File Organization – Organization of Records in Files – Indexing and Hashing – Ordered Indices – B+ tree Index Files – Static Hashing – Dynamic Hashing – Query Processing Overview – Catalog Information for Cost Estimation – Query Optimization.

UNIT V NOSQL DATABASE 9

Overview of Distributed Databases – Data Fragmentation – Replication – NOSQL Database: Characteristics – CAP theorem – Outline of NOSQL Datastores: Column Oriented, Document, Key-Value and Graph Types – Applications – CRUD Operations.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

At the end of the course the

CO1: Explain the concepts of Database Management Systems and Apply SQL Queries Using relational Algebra

CO2: Apply conceptual modeling to real world applications and design database schemas

CO3: Demonstrate an understanding of normalization theory and apply such knowledge to the normalization of a database.

CO4: Explain the concepts of Transaction Processing and maintain consistency of the database.

CO5: Explain basic database storage structures, access techniques and query processing.

CO6: Describe distributed, semi-structured and unstructured database systems.

TEXT BOOKS:

1. Abraham Silberschatz, Henry F. Korth, S. Sudharshan,"Database System Concepts", Seventh Edition, Tata McGraw Hill, 2019.
2. Ramez Elmasri, Shamkant B. Navathe, "Fundamentals of Database Systems", Seventh Edition, Pearson Education, 2021.

REFERENCE BOOKS:

1. C. J. Date, A. Kannan, S. Swamynathan, "An Introduction to Database Systems", Eighth Edition, Pearson Education, 2006.
2. Raghu Ramakrishnan, Johannes Gehrke, "Database Management Systems", Fourth Edition, Tata McGraw Hill, 2010.
3. G. K. Gupta, "Database Management Systems", Tata McGraw Hill, 2011.
4. Carlos Coronel, Steven Morris, Peter Rob, "Design Implementation and Management", Ninth Edition, Cengage Learning, 2011.

COs	**POs**												**PSOs**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
1	3	2	1	-	-	-	-	-	-	-	-	-	3	-	-
2	3	2	2	-	-	-	-	-	-	-	-	-	3	-	-
3	3	3	2	-	-	-	-	-	-	-	-	-	3	-	-
4	3	2	1	-	-	-	-	-	-	-	-	-	3	-	-
5	3	2	1	-	-	-	-	-	-	-	-	-	3	-	-
6	3	2	1	-	-	-	-	-	-	-	-	-	3	-	-
Overall correlation	**3**	**3**	**2**	-	-	-	-	-	-	-	-	-	**3**	-	-

23HS301	UNIVERSAL HUMAN VALUES AND ETHICS	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- Development of a holistic perspective based on self-exploration about themselves (human being), family, society and nature/existence.
- Understanding (or developing clarity) of the harmony in the human being, family, society and nature/existence.
- Strengthening of self-reflection.
- Development of commitment and courage to act.

UNIT I COURSE INTRODUCTION **9**

Need, Basic Guidelines, Content and Process for Value Education - Understanding the need, basic guidelines, content and process for Value Education -Self Exploration–what is it? - its content and process; 'Natural Acceptance' and Experiential Validation- as the mechanism for self exploration - Continuous Happiness and Prosperity- A look at basic Human Aspirations -Right understanding, Relationship and Physical Facilities- the basic requirements for fulfilment of aspirations of every human being with their correct priority -Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario -Method to fulfil the above human aspirations: understanding and living in harmony at various levels.

UNIT II UNDERSTANDING HARMONY IN THE HUMAN BEING **9**

Harmony in Myself- Understanding human being as a co-existence of the sentient 'I' and the material 'Body' -Understanding the needs of Self ('I') and 'Body' - Sukh and Suvidha- Understanding the Body as an instrument of 'I' (I being the doer, seer and enjoyer) - Understanding the characteristics and activities of 'I' and harmony in 'I' -Understanding the harmony of I with the Body: Sanyam and Swasthya; correct appraisal of Physical needs, meaning of Prosperity.

UNIT III UNDERSTANDING HARMONY IN THE FAMILY AND SOCIETY **9**

Harmony in Human-Human Relationship -Understanding Harmony in the family – the basic unit of human interaction -Understanding values in human-human relationship; meaning of Nyaya and program for its fulfilment to ensure satisfaction; Trust(Vishwas) and Respect as the foundational values of relationship -Understanding the meaning of Vishwas; Difference between intention and competence -Understanding the meaning of Samman, Difference between respect and differentiation; the other salient values in relationship -Understanding the harmony in the society (society being an extension of family)-Visualizing a universal harmonious order in society- Undivided Society (Akhand Samaj), Universal Order- from family to world family.

UNIT IV ENGINEERING ETHICS **9**

Senses of ‗Engineering Ethics„ – Variety of moral issues – Types of inquiry – Moral dilemmas – Moral Autonomy – Kohlberg's theory – Gilligan's theory – Consensus and Controversy – Models of professional roles - Theories about right action – Self-interest – Customs and Religion – Uses of Ethical Theories.

UNIT V SAFETY, RESPONSIBILITY AND RIGHTS **9**

Safety and Risk – Assessment of Safety and Risk – Risk Benefit Analysis and Reducing Risk - Respect for Authority – Collective Bargaining – Confidentiality – Conflicts of Interest – Occupational Crime – Professional Rights – Employee Rights – Intellectual Property Rights (IPR) – Discrimination-Moral Leadership –Code of Conduct – Corporate Social Responsibility.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

At the end of the course the students will be able to

CO1: Understand the need of value education.

CO2: Comprehend the difference between self and body.

CO3: Understand the need to exist as an unit of Family and society.

CO4: Understand Harmony at all levels.

CO5: Apply the values acquired in the professional front.

CO6: Identify appropriate technologies for ecofriendly production systems.

TEXT BOOKS:

1. Human Values and Professional Ethics by R R Gaur, R Sangal, G P Bagaria, Excel Books, New Delhi, 2010 3.
2. Mike W. Martin and Roland Schinzinger, ―Ethics in Engineering‖, Tata McGraw Hill, New Delhi, 2003.
3. Govindarajan M, Natarajan S, Senthil Kumar V. S, ―Engineering Ethics‖, Prentice Hall of India, New Delhi, 2004

REFERENCE BOOKS:

1. Jeevan Vidya: Ek Parichaya, A Nagaraj, Jeevan Vidya Prakashan, Amarkantak, 1999.
2. Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004.
3. The Story of Stuff (Book).
4. The Story of My Experiments with Truth - by Mohandas Karamchand Gandhi AICTE Model Curriculum in Humanities, Social Science and Management Courses (UG Engineering & Technology) 169 | Page .
5. Small is Beautiful - E. F Schumacher.
6. Slow is Beautiful - Cecile Andrews.
7. Economy of Permanence - J C Kumarappa 8. Bharat Mein Angreji Raj – Pandit Sunderlal.

8. Rediscovering India - by Dharampal.
9. Hind Swaraj or Indian Home Rule - by Mohandas K. Gandhi .
10. India Wins Freedom - Maulana Abdul Kalam Azad.
11. Vivekananda - Romain Rolland (English) 13. Gandhi - Romain Rolland (English).
12. Charles B. Fleddermann, ―Engineering Ethics‖, Pearson Prentice Hall, New Jersey, 2004.
13. Charles E. Harris, Michael S. Pritchard and Michael J. Rabins, ―Engineering Ethics – Concepts and Cases‖, Cengage Learning, 2009.

WEB SOURCES:

1. www.onlineethics.org
2. www.nspe.org
3. www.globalethics.org

COs	POs												PSOs		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
1	-	-	-	-	-	3	3	3	3	3	-	-	-	-	3
2	-	-	-	-	-	3	3	3	3	3	-	-	-	-	3
3	-	-	-	-	-	3	3	3	3	3	-	-	-	-	3
4	-	-	-	-	-	3	3	3	3	3	-	-	-	-	3
5	-	-	-	-	-	3	3	3	3	3	-	-	-	-	3
6	-	-	-	-	-	3	3	3	3	3	-	-	-	-	3
Overall correlation	-	-	-	-	-	3	3	3	3	3	-	-	-	-	3

23CS311 DIGITAL PRINCIPLES AND SYSTEM DESIGN

	L	T	P	C
	3	0	2	4

COURSE OBJECTIVES:

- To design digital circuits using simplified Boolean functions.
- To analyze and design combinational circuits.
- To analyze and design synchronous and asynchronous sequential circuits.
- To understand Programmable Logic Devices.
- To write HDL code for combinational and sequential circuits.

UNIT I BOOLEAN ALGEBRA AND LOGIC GATES 9

Number Systems - Arithmetic Operations - Binary Codes- Boolean Algebra and Logic Gates - Theorems and Properties of Boolean Algebra - Boolean Functions - Canonical and Standard Forms - Simplification of Boolean Functions using Karnaugh Map - Logic Gates – NAND and NOR Implementations.

UNIT II COMBINATIONAL LOGIC 9

Combinational Circuits – Analysis and Design Procedures - Binary Adder-Subtractor - Decimal Adder - Binary Multiplier - Magnitude Comparator - Decoders – Encoders – Multiplexers - Introduction to HDL – HDL Models of Combinational circuits.

UNIT III SYNCHRONOUS SEQUENTIAL LOGIC 9

Sequential Circuits - Storage Elements: Latches , Flip-Flops - Analysis of Clocked Sequential Circuits - State Reduction and Assignment - Design Procedure - Registers and Counters - HDL Models of Sequential Circuits.

UNIT IV ASYNCHRONOUS SEQUENTIAL LOGIC 9

Analysis and Design of Asynchronous Sequential Circuits – Reduction of State and Flow Tables – Race-free State Assignment – Hazards.

UNIT V MEMORY AND PROGRAMMABLE LOGIC 9

RAM – Memory Decoding – Error Detection and Correction - ROM - Programmable Logic Array – Programmable Array Logic – Sequential Programmable Devices.

TOTAL: 45 PERIODS

PRACTICAL EXERCISES: 30 PERIODS

1. Design of adders and subtractors.
2. Design of code converters.
3. Design of Multiplexers & Demultiplexers.
4. Design of Encoders and Decoders.
5. Design of Magnitude Comparators
6. Design and implementation of counters using flip-flops
7. Design and implementation of shift registers.

COURSE OUTCOMES:

At the end of the course the students will be able to

CO1: Simplify Boolean functions using K-Map.

CO2: Design and Analyze Combinational Circuits.

CO3: Design and Analyze Sequential Circuits.

CO4: HDL models for combinational and Sequential Circuits.

CO5: Illustrate various Asynchronous sequential circuits.

CO6: Implement designs using Programmable Logic Devices.

TOTAL: 45 + 30 = 75 PERIODS

TEXT BOOKS:

1. M. Morris R. Mano, Michael D. Ciletti, "Digital Design: With an Introduction to the Verilog HDL, VHDL, and System Verilog", 6th Edition, Pearson Education, 2017.
2. G. K. Kharate, "Digital Electronics", Oxford University Press, 2010

REFERENCE BOOKS:

1. John F. Wakerly, "Digital Design Principles and Practices", Fifth Edition, Pearson Education, 2017.
2. Charles H. Roth Jr, Larry L. Kinney, "Fundamentals of Logic Design", Sixth Edition, CENGAGE Learning, 2013.
3. Donald D. Givone, "Digital Principles and Design", Tata Mc Graw Hill, 2003.

COs	POs												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	2	1	-	-	1	-	-	-	-	1	-	-	2	1	-
2	3	2	1	1	1	-	-	-	-	1	-	-	3	1	-
3	3	2	1	1	2	-	-	-	2	1	-	-	3	1	-
4	3	2	1	1	2	-	-	-	2	1	-	-	3	1	-
5	2	1	-	-	1	-	-	-	2	1	-	-	2	1	-
6	2	1	-	-	1	-	-	-	-	1	-	-	2	1	-
Overall correlation	**3**	**2**	**1**	**1**	**2**	-	-	-	**2**	**2**	-	-	**3**	**2**	-

23IT311 ADVANCED ALGORITHMS

L	T	P	C
3	0	2	4

COURSE OBJECTIVES:

- To explain and apply the algorithm analysis techniques on searching and sorting networks.
- To explain string matching algorithms.
- To critically analyze the efficiency of graph algorithms.
- To explain different algorithm design techniques.
- To solve programming problems using state space tree.
- To understand the concepts behind NP Completeness, Approximation algorithms and randomized algorithms.

UNIT I INTRODUCTION 9

Algorithm analysis: Time and space complexity - Asymptotic Notations and its properties best case, Worst case and average case analysis. Recurrence relation: substitution method - Lower bounds. Searching: linear search, binary search and Interpolation Search-Pattern search: The naïve string-matching algorithm - Rabin-Karp algorithm - Knuth-Morris-Pratt algorithm. Sorting Networks: Bitonic Sorting Networks, Merging Network, Sorting Network.

UNIT II GRAPH ALGORITHMS 9

Graph algorithms: Representations of graphs - Graph traversal: DFS – BFS - applications - Connectivity, strong connectivity, bi-connectivity. Minimum spanning tree: Kruskal's and Prim's algorithm. Shortest path: Bellman-Ford algorithm - Dijkstra's algorithm - Floyd-Warshall algorithm Network flow: Flow networks - Ford-Fulkerson method. Matching: Maximum bipartite matching

UNIT III ALGORITHM DESIGN TECHNIQUES 9

Divide and Conquer methodology: Finding maximum and minimum - Merge sort - Quick sort. Dynamic programming: Elements of dynamic programming — Matrix-chain multiplication - Multi stage graph — Optimal Binary Search Trees. Greedy Technique: Elements of the greedy strategy - Activity-selection problem –- Optimal Merge pattern — Huffman Trees.

UNIT IV STATE SPACE SEARCH ALGORITHMS 9

Backtracking : n-Queens problem - Hamiltonian Circuit Problem - Subset Sum Problem - Graph colouring problem Branch and Bound : Solving 15-Puzzle problem - Assignment problem - Knapsack Problem - Travelling Salesman Problem.

UNIT V NP-COMPLETE AND APPROXIMATION ALGORITHM 9

Tractable and intractable problems: Polynomial time algorithms – Venn diagram representation - NP-algorithms - NP-hardness and NP-completeness – Bin Packing problem – Problem reduction: TSP – 3-CNF problem. Approximation Algorithms: TSP - Randomized Algorithms: concept and application - primality testing - randomized quick sort - Finding kth smallest number.

TOTAL: 45 PERIODS

PRACTICAL EXERCISES: 30 PERIODS

Searching and Sorting Algorithms

1. Implement Linear Search. Determine the time required to search for an element. Repeat the experiment for different values of n, the number of elements in the list to be searched and plot a graph of the time taken versus n.
2. Implement recursive Binary Search. Determine the time required to search an element. Repeat the experiment for different values of n, the number of elements in the list to be searched and plot a graph of the time taken versus n.
3. Sort a given set of elements using the sorting networks methods and determine the time required to sort the elements. Repeat the experiment for different values of n, the number of elements in the list to be sorted and plot a graph of the time taken versus n.

Graph Algorithms

1. Develop a program to implement graph traversal using Breadth First Search
2. Develop a program to implement graph traversal using Depth First Search
3. From a given vertex in a weighted connected graph, develop a program to find the shortest paths to other vertices using Dijkstra's algorithm.
4. Find the minimum cost spanning tree of a given undirected graph using Prim's algorithm.
5. Implement Floyd's algorithm for the All-Pairs- Shortest-Paths problem.
6. Compute the transitive closure of a given directed graph using Warshall's algorithm.

Algorithm Design Techniques

1. Develop a program to find out the maximum and minimum numbers in a given list of n numbers using the divide and conquer technique.
2. Implement Merge sort and Quick sort methods to sort an array of elements and determine the time required to sort. Repeat the experiment for different values of n, the number of elements in the list to be sorted and plot a graph of the time taken versus n.

State Space Search Algorithms

1. Implement N Queens problem using Backtracking.

Approximation Algorithms Randomized Algorithms

1. Implement any scheme to find the optimal solution for the Traveling Salesperson problem and then solve the same problem instance using any approximation algorithm and determine the error in the approximation.
2. Implement randomized algorithms for finding the kth smallest number.

The programs can be implemented in C / C++ / Python.

COURSE OUTCOMES:

At the end of the course the students will be able to

CO1: Analyze the efficiency of algorithms using various frameworks.

CO2: Apply graph algorithms to solve problems and analyze their efficiency.

CO3: Make use of algorithm design techniques like divide and conquer, dynamic programming and greedy techniques to solve problems.

CO4: Use the state space tree method for solving problems.

CO5: Solve problems using approximation algorithms and randomized algorithms.

CO6: Apply String matching algorithms to solve problems and analyze their efficiency.

TEXT BOOKS:

1. Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest and Clifford Stein, "Introduction to Algorithms", 3rd Edition, Prentice Hall of India, 2009.
2. Ellis Horowitz, Sartaj Sahni, Sangu thevar Rajasekaran "Computer Algorithms/C++" Orient Blackswan, 2nd Edition, 2019.

REFERENCE BOOKS:

1. Anany Levitin, "Introduction to the Design and Analysis of Algorithms", 3rd Edition, Pearson Education, 2012.
2. Alfred V. Aho, John E. Hopcroft and Jeffrey D. Ullman, "Data Structures and Algorithms", Reprint Edition, Pearson Education, 2006. 3. S. Sridhar, "Design and Analysis of Algorithms", Oxford university press, 2014.

COs	**POs**												**PSOs**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
1	2	1	2	1	2	-	-	-	-	2	1	1	1	2	2
2	2	2	1	2	2	-	-	-	-	1	2	2	1	1	2
3	1	1	2	1	2	-	-	-	-	1	2	2	1	1	1
4	1	2	1	2	1	-	-	-	-	1	1	2	2	1	2
5	2	1	2	2	1	-	-	-	-	1	1	2	2	1	1
6	2	1	2	2	1	-	-	-	-	1	1	2	2	1	1
Overall correlation	2	2	2	2	2	-	-	-	-	1	1	2	1	1	2

23IT321 JAVA PROGRAMMING LABORATORY

	L	T	P	C
	0	0	2	4

COURSE OBJECTIVES:

- Strengthen problem solving ability by using the characteristics of an object-oriented approach.
- Design applications using object-oriented features
- Handle Exceptions in programs.
- Write, compile, run and debug the programs to demonstrate the usage of object-oriented concepts both in C++ and JAVA.

EXERCISES

I. Programs to demonstrate the usage of Class, Operator Overloading and Friend Functions.

1. Write a C++ program to display Names, Roll No., and grade of 3 students who have appeared in the examination. Declare the class of name, roll no., and grade. Create an array of class objects. Read and display the contents of the array.
2. Write a Program using copy constructor to copy data of anobject to another object.
3. Write a program to design a class representing complexnumbers and having the functionality of performing addition &multiplication of two complex numbers using operator overloading.
4. Write a Program to design a class complex to represent complex numbers. The complex class should use an external function (use it as a friend function) to add twocomplex numbers. The function should return an object of type complex representing the sum of two complex numbers.

II. Basics of Java and Exception Handling

1. Develop a java application with Employee class with Emp_name, Emp_id, Address, Mail_id, Mobile_no as members. Inherit the classes, Programmer, Assistant Professor, Associate Professor and Professor from employee class. Add Basic Pay (BP) as the member of all the inherited classes with 97% of BP as DA, 10 % of BP as HRA, 12% of BP as PF, 0.1% of BP for staff club fund. Generate pay slips for the employees with their gross and net salary.
2. Write a Java Program to create an abstract class named Shape that contains two integers and an empty method named print Area(). Provide three classes named Rectangle, Triangle and Circle such that each one of the classes extends the class Shape. Each one of the classes contains only the method print Area () that prints the area of the given shape.
3. Write a Java program to implement user defined exception handling.
4. Write a Java program that reads a file name from the user, displays information about whether the file exists, whether the file is readable, or writable, the type of file and the length of the file in bytes.

III. The usage of Packages and Interfaces, Multithreaded programming, Generic Programming

1. Write a Java program to perform employee payroll processing using packages. In the java file, Emp.java creates a package employee and creates a class Emp. Declare the variables name,empid, category, bpay, hra, da, npay, pf, grosspay, incometax, and allowance. Calculate the values in methods. Create another java file Emppay.java. Create an object e to call the methods to perform and print values.

2. Write a Java program to create an interface Shape with the getArea() method. Create three classes Rectangle, Circle, and Triangle that implement the Shape interface. Implement the getArea() method for each of the three classes.

3. Write a java program that implements a multi-threaded application that has three threads. The first thread generates a random integer every 1 second and if the value is even, the second thread computes the square of the number and prints. If the value is odd, the third thread will print the value of cube of the number.

4. Write a java program to find the maximum value from the given type of elements using a generic function.

IV. The usage of Event Driven Programming

1. Write a java program to draw lines, arcs, figures, images and text in different Fonts, styles and colours.
2. Write a java program to create Frames using swing.
3. Design a calculator using event-driven programming paradigm of Java with the following options.
   a. Decimal manipulations
   b. Scientific manipulations
4. Write a java program that simulates a traffic light. The program lets the user select one of three lights: red, yellow, or green with radio buttons. On selecting a button, an appropriate message with "stop" or "ready" or "go" should appear above the buttons in a selected color. Initially there is no message shown.

TOTAL: 30 PERIODS

COURSE OUTCOMES:

At the end of the course the students will be able to

CO1: Solve the problems using the characteristics of an object-oriented approach.

CO2: Design applications using object-oriented features.

CO3: Develop and implement Java programs that make use of classes, packages and interfaces.

CO4: Develop and implement Java programs with exception handling and multithreading.

CO5: Design applications using file processing, generic programming and event handling.

COs	POs												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	3	2	3	-	2	-	-	-	-	-	-	2	3	-	-
2	3	3	3	-	2	-	-	-	-	-	-	2	3	-	-
3	3	3	3	-	2	-	-	-	-	-	-	2	3	-	-
4	3	2	2	-	2	-	-	-	-	-	-	2	3	-	-
5	3	3	3	-	3	-	-	-	-	-	-	2	3	-	-
Overall Correlation	**3**	**3**	**3**	**-**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**3**	**-**	**-**

23CS322 DATABASE MANAGEMENT SYSTEMS LABORATORY

L	T	P	C
0	0	2	4

COURSE OBJECTIVES:

- To learn and implement important commands in SQL.
- To learn the usage of nested and join queries.
- To understand functions, procedures and procedural extensions of databases.
- To understand design and implementation of typical database applications.
- To understand design of NoSQL
- To be familiar with the use of a front end tool for GUI based application development and its integration with databases.

LIST OF EXPERIMENTS

1. Create a database table, add constraints (primary key, unique, check, Not null), insert rows, update and delete rows using SQL DDL and DML commands.
2. Create a set of tables, add foreign key constraints and incorporate referential integrity.
3. Query the database tables using different 'where' clause conditions and also implement aggregate functions.
4. Query the database tables and explore sub queries and simple join operations.
5. Write user defined functions and stored procedures in SQL.
6. Create View and index for database tables with a large number of records.
7. Write row level and statement level SQL Triggers.
8. Create Document, column and graph based data using NOSQL database tools.
9. Add Implement CRUD operation using NOSQL Database.
10. Develop a simple GUI based database application and incorporate all the above mentioned features

TOTAL: 45 PERIODS

COURSE OUTCOMES:

At the end of the course the students will be able to

CO1: Create databases with different types of key constraints.

CO2: Create join queries and explore sub queries.

CO3: Implement queries using aggregate functions.

CO4: Use advanced features such as stored procedures and triggers and incorporate in GUI based application development.

CO5: Create and manipulate data using NOSQL database.

CO6: Develop applications that require a Front-end Tool linked with database

COs	POs												PSOs		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
1	2	2	1	1	2	-	-	1	1	1	-	1	2	2	1
2	2	2	1	1	2	-	-	1	1	1	-	1	2	2	1
3	2	2	1	1	2	-	-	1	1	1	-	1	2	2	1
4	2	2	1	1	2	-	-	1	1	1	-	1	2	2	1
5	2	2	1	1	2	-	-	1	1	1	-	1	2	2	1
6	2	2	1	1	2	-	-	1	1	1	-	1	2	2	1
Overall Correlation	2	2	1	1	2	-	-	1	1	1	-	1	2	2	1

23ES391 PRESENTATION SKILLS

L	T	P	C
0	0	2	1*

COURSE OBJECTIVES:

- To help learners use brainstorming techniques for generating, organizing and outlining ideas.
- To familiarize learners with different speech structures by engaging them in watching speeches with great opening and closing
- To give practice on voice modulation and use of body language and eye contact for making captivating presentations
- To give hands on training on preparing presentation slides and using remote presentation tools
- To train students on responding to question and feedback with confidence.

UNIT I BRAINSTORMING AND OUTLINING 6

Mind Mapping based on prior knowledge, collecting additional information from external resources, giving prompts to Generative AI tools seeking information, organizing ideas generated, knowing your audience

UNIT II STRUCTURING THE PRESENTATION 6

3 Ts of a presentation, writing effective introduction- Beginning the introduction with a hook (question, data, storytelling) and closing the introduction with the objective of the presentation. Structuring the body paragraphs -Choosing key ideas from the list of ideas generated during brainstorming. Substantiating ideas with examples, data, reasons and anecdotes. Summarizing the ideas for conclusion.

UNIT III DELIVERY TECHNIQUES 6

Vocal variety, intonation, reducing filler words and improving articulation, inflection, engaging the audience. Body language- eye contact, gestures, movement on stage.

UNIT IV USE OF TECHNOLOGICAL AIDS 6

Use of presentation software like MS Power Point, Google Slides etc, incorporating images, graphs, charts and videos, using interactive tools like quizzes and polls, using remote presentation tools like zoom, MS Teams, WebEx for screen sharing, virtual whiteboards and chat functionalities, incorporating AR/VR for more immersive presentations .

UNIT V HANDLING QUESTIONS AND FEEDBACK 6

Audience engagement through questions, PAR (Point, Answer, Redirect) strategy for structuring responses to questions. Understanding feedback process - Receiving, interpreting and evaluating constructively, active listening techniques for processing feedback, responding to feedback- acknowledging, clarifying and appreciating, Dealing with challenging feedback.

TOTAL: 30 PERIODS

COURSE OUTCOMES:

After completion of the course, the students should be able to

CO1 construct ideas for presentation through mind mapping techniques

CO2 organize ideas and structure the presentation with captivating introduction, body paragraphs illustrated with examples and reasons and compelling conclusion

CO3 apply vocal variety and body language techniques to enhance delivery

CO4 prepare engaging presentations by integrating multimedia elements

CO5 demonstrate proficiency in delivering presentations in remote platforms utilizing various technological tools and strategies to engage audience in virtual environments

CO6 exhibit active listening skills by responding to questions with clarity and confidence and incorporating constructive feedback for professional development

TEXT BOOKS:

1. "Slide:ology: The Art and Science of Creating Great Presentations" by Nancy Duarte. O'Reilly Media.
2. "The Naked Presenter: Delivering Powerful Presentations With or Without Slides" by Garr Reynolds. New Riders.

REFERENCE BOOK:

Talk Like TED: The 9 Public-Speaking Secrets of the World's Top Minds" by Carmine Gallo.

23MA301 LINEAR ALGEBRA

L	T	P	C
3	1	0	4

COURSE OBJECTIVES:

- To test the consistency and solve system of linear equations
- To find the basis and dimension of vector space
- To obtain the matrix of linear transformation and its eigenvalues and eigenvectors
- To find orthonormal basis of inner product space and find least square approximation
- To find eigenvalues of a matrix using numerical techniques and perform matrix decomposition.

UNIT I MATRICES AND SYSTEM OF LINEAR EQUATIONS 9+3

Matrices - Row echelon form - Rank - System of linear equations - Consistency - Gauss elimination method - Gauss Jordon method – Gauss Seidel Method

UNIT II VECTOR SPACES 9+3

Vector spaces - Subspace - Linear independence and dependence – Linear Span - Basis and dimension – Maximal Linearly Independent Subsets.

UNIT III LINEAR TRANSFORMATION 9+3

Linear transformation - Rank space and null space - Rank and nullity - Dimension theorem - Matrix representation of linear transformation - Eigenvalues and eigenvectors of linear transformation – Invertibility and Isomorphisms – Dual Spaces – Homogeneous Linear Differential Equations with Constant coefficients .

UNIT IV INNER PRODUCT SPACES 9+3

Inner product and norms - Properties - Orthogonal, Orthonormal vectors - Gram Schmidt orthonormalization process – Adjoint of Linear operator – Normal and self adjoint operators – Unitary and orthogonal operators and their Matrices

UNIT V EIGENVALUE PROBLEMS AND MATRIX DECOMPOSITION 9+3

Eigen value Problems - Power method, Jacobi rotation method - Singular value decomposition - QR decomposition – Generalized Inverse - Least square solution

TOTAL: 60 PERIODS

COURSE OUTCOMES:

At the end of the course the students will be able to

CO 1 Test the consistency and solve system of linear equations.

CO 2 Find the basis and dimension of vector space.

CO 3 Obtain the matrix of linear transformation and its eigenvalues and eigenvectors.
CO 4 Find orthonormal basis of inner product space and least square approximation.
CO 5 Find eigenvalues of a matrix using numerical techniques
CO 6 Perform Matrix Decomposition using different techniques

TEXT BOOKS:

1. Friedberg A.H, Insel A.J. and Spence L, "Linear Algebra", Prentice Hall of India, New Delhi, 2004.
2. Faires J.D. and Burden R., "Numerical Methods", Brooks/Cole (Thomson Publications), New Delhi, 2002.

REFERENCE BOOKS:

1. Kumaresan S, "Linear Algebra - A geometric approach", Prentice Hall of India, New Delhi, Reprint, 2010.
2. P.S.Das – "Numerical Analysis", Pearson Educations, New Delhi, 2002
3. Richard Branson, "Matrix Operations", Schaum's outline series, 1989.

COs	POs												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	3	2	2	-	-	-	-	-	-	-	-	-	-	-	2
2	3	2	2	-	-	-	-	-	-	-	-	-	-	-	2
3	3	2	2	-	-	-	-	-	-	-	-	-	-	-	2
4	3	2	2	-	-	-	-	-	-	-	-	-	-	-	2
5	3	2	2	-	-	-	-	-	-	-	-	-	-	-	2
6	3	2	2	-	-	-	-	-	-	-	-	-	-	-	2
Overall Correlation	3	2	2	-	-	-	-	-	-	-	-	-	-	-	2

23IT401 MACHINE LEARNING

L	T	P	C
3	0	0	3

COURSE OBJECTIVES:

- Apply the basic concepts of machine learning
- To analyze the principles and algorithms of supervised machine learning
- Study about ensembling and unsupervised learning algorithms
- Learn the basics of deep learning using neural networks
- Design and analyse machine learning experiments

UNIT I INTRODUCTION TO MACHINE LEARNING 10

Definition of learning systems - Goals and applications of machine learning - Aspects to develop a Learning system: Training data, Concept representation - Function approximation - Learning Techniques - Supervised learning, unsupervised learning and Reinforcement learning.

UNIT II SUPERVISED LEARNING 11

Linear Regression Models: Least squares, single & multiple variables, Bayesian linear regression, gradient descent, Linear Classification Models: Discriminant function – Probabilistic discriminative model - Logistic regression, Probabilistic generative model – Naive Bayes, Maximum margin classifier – Support vector machine, Decision Tree, Random forests

UNIT III ENSEMBLE TECHNIQUES AND UNSUPERVISED LEARNING 9

Combining multiple learners: Model combination schemes, Voting, Ensemble Learning - bagging, boosting, stacking, Unsupervised learning: K-means, KNN, Anomaly Detection, Neural networks, Apriori algorithm

UNIT IV NEURAL NETWORKS 8

Perceptron - Multilayer perceptron, activation functions, network training – gradient descent optimization – stochastic gradient descent, error backpropagation, from shallow networks to deep networks –Unit saturation (aka the vanishing gradient problem) – ReLU, hyperparameter tuning, batch normalization, regularization, dropout

UNIT V DESIGN AND ANALYSIS OF MACHINE LEARNING EXPERIMENTS 9

Guidelines for machine learning experiments, Cross Validation (CV) and resampling – K-fold CV, bootstrapping, measuring classifier performance, assessing a single classification algorithm and comparing two classification algorithms – t test, McNemar’s test, K-fold CV paired t test, Case study.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

At the end of the course the students will be able to

CO1: Apply the basic concepts of machine learning

CO2: Analyze the principles and algorithms of supervised machine learning

CO3: Study about ensembling and unsupervised learning algorithms

CO4: Learn the basics of deep learning using neural networks

CO5: Design and analyse machine learning experiments

TEXT BOOKS:

1. Ethem Alpaydin, "Introduction to Machine Learning", MIT Press, Fourth Edition, 2020.
2. Tom M Mitchell, —Machine Learning, Third Edition, Tata McGraw-Hill, 2017

REFERENCE BOOKS:

1. Peter Flach, —Machine Learning: The Art and Science of Algorithms that Make Sense of Data, First Edition, Cambridge University Press, 2012
2. Jason Bell, —Machine learning – Hands on for Developers and Technical Professionals, First Edition, Wiley, 2014
3. Christopher M. Bishop, "Pattern Recognition and Machine Learning", Springer, 2006.
4. Mehryar Mohri, Afshin Rostamizadeh, Ameet Talwalkar, "Foundations of Machine Learning", MIT Press, 2012.
5. Aman Kharwal, "Machine Learning Algorithms: Handbook", Clever Fox Publishing, 2023
6. Manaranjan Pradhan, U Dinesh Kumar, "Machine Learning Using Python", Wiley India Private Ltd, 2019

COs	**POs**												**PSOs**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
1	3	1	1	-	-	-	-	-	-	-	-	-	2	2	2
2	2	1	2	1	1	-	-	-	2	1	1	3	1	1	1
3	3	1	3	1	-	-	-	-	2	1	2	1	2	2	2
4	3	1	1	2	2	-	-	-	3	1	2	3	2	1	2
5	3	2	2	1	1	-	-	-	3	3	-	2	3	3	2
Overall Correlation	3	2	2	1	2	-	-	-	2	2	1	2	2	2	2

23CS401 OPERATING SYSTEMS

	L	T	P	C
	3	0	0	3

COURSE OBJECTIVES:

- To understand the basics and functions of operating systems.
- To understand processes and threads
- To analyze scheduling algorithms and process synchronization.
- To understand the concept of deadlocks.
- To analyze various memory management schemes.
- To be familiar with I/O management and file systems.
- To be familiar with the basics of virtual machines and Mobile OS like iOS and Android**.**

UNIT I INTRODUCTION 10

Introduction to Operating Systems – Views of Operating system, Computer System organization, Computer System Architecture; **Operating System Structures** – Operating System Services - User Operating System Interface - System Calls – System Programs - Design and Implementation - Structuring methods; **Processes** - Process Concept, Process Scheduling, Operations on Processes, Inter-process Communication – Shared Memory Systems, Message Passing Systems, **Threads** - Multithread Models.

UNIT II PROCESS MANAGEMENT 11

CPU Scheduling – Basic Concepts, Scheduling criteria - Scheduling algorithms; **Process Synchronization** - The Critical-Section problem, Synchronization hardware, Mutex Locks, Semaphores, Monitors, Classical problems of synchronization; **Deadlock** – Deadlock Characterization, Methods for handling deadlocks, Deadlock prevention, Deadlock avoidance, Deadlock detection, Recovery from deadlock.

UNIT III MEMORY MANAGEMENT 9

Main Memory – Address Binding, Logical and Physical Address Space, Contiguous Memory Allocation, Segmentation, Paging, Structure of the Page Table; **Virtual Memory** - Demand Paging, Copy on Write, Page Replacement, Thrashing.

UNIT IV STORAGE MANAGEMENT 8

Mass Storage system –Disk Scheduling and Management; **I/O Systems** – I/O Hardware, Kernel I/O subsystem; File-System Interface - File concept, Access methods, Directory Structure, File system mounting - File Sharing and Protection; **File System Implementation** - File System Structure - Directory implementation - Allocation Methods - Free Space Management;

UNIT V VIRTUAL MACHINES AND MOBILE OS 9

Virtual Machines – Benefits and Features, Building Blocks, Types of Virtual Machines and their Implementations, Virtualization and Operating-System Components; Mobile OS - iOS and Android.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

At the end of the course the students will be able to

- **CO1** Explain operating system structures and various services provided by operating systems
- **CO2** Apply Process synchronization, process scheduling, and deadlocks concepts in the given scenario to solve the problems.
- **CO3** Apply algorithms and suitable techniques for memory management.
- **CO4** Apply disk scheduling algorithm and explain the management schemes for storage systems such as file and I/O systems.
- **CO5** Explain the concept of Virtual machines
- **CO6** Explain the functionalities of iOS and Android Operating Systems.

TEXT BOOK:

Abraham Silberschatz, Peter Baer Galvin and Greg Gagne, "Operating System Concepts", 10th Edition, John Wiley and Sons Inc., 2018.

REFERENCE BOOKS:

1. Ramaz Elmasri, A. Gil Carrick, David Levine, "Operating Systems – A Spiral Approach", Tata McGraw Hill Edition, 2010.
2. William Stallings, "Operating Systems: Internals and Design Principles", 7th Edition, Prentice Hall, 2018.
3. Achyut S.Godbole, Atul Kahate, "Operating Systems", McGraw Hill Education, 2016.

COs	POs												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	2	1	1	1	1	-	-	1	1	1	1	2	2	1	-
2	3	2	1	1	1	-	-	1	1	1	1	2	3	1	-
3	3	2	1	1	1	-	-	1	1	1	1	2	3	1	-
4	2	1	1	1	1	-	-	1	1	1	1	1	1	-	-
5	3	2	1	1	1	-	-	1	1	1	-	1	1	-	-
6	2	1	1	1	1	-	-	1	1	1	-	2	2	1	-
Overall Correlation	3	3	2	1	1	-	-	1	1	1	1	2	2	1	-

23IT402	FORMAL LANGUAGES AND AUTOMATA THEORY	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To understand a finite automaton for a given language.
- To understand the relation between grammar and language.
- To understand the basic principles of working of a compiler.
- To study about the type checking procedure during the compilation.
- To understand the storage structure of the running program.

UNIT I AUTOMATA **9**

Introduction to formal proof – Additional forms of proof – Inductive proofs –Finite Automata (FA) – Deterministic Finite Automata (DFA) – Non-deterministic Finite Automata (NFA) – Finite Automata with Epsilon transitions- Equivalence and minimization of Automata.

UNIT II REGULAR EXPRESSION (RE **9**

Definition, Operators of regular expression and their precedence, Algebraic laws for Regular expressions, Kleen's Theorem, Regular expression to FA, DFA to Regular expression, Arden Theorem, Non Regular Languages, Pumping Lemma for regular Languages, Application of Pumping Lemma, Closure properties of Regular Languages, Decision properties of Regular Languages.

UNIT III CONTEXT FREE GRAMMARS AND LANGUAGES **9**

GRAMMAR FORMALISM: Regular grammars-Right linear and left linear grammars, Equivalence Between regular linear grammar and FA; Context Free Grammar, Definition, Examples, Derivation, Derivation trees, Ambiguity in Grammar, Inherent ambiguity, Ambiguous to Unambiguous CFG, Useless symbols, Simplification of CFGs; Normal forms for CFGs - CNF and GNF, Closure properties of CFLs; Decision Properties of CFLs- Emptiness, Finiteness and Membership, Pumping lemma for CFLs.

UNIT IV PUSH DOWN AUTOMATA (PDA) **9**

Description and definition, Instantaneous Description, Language of PDA, Acceptance by Final state, Acceptance by empty stack, Deterministic PDA, Equivalence of PDA and CFG, CFG to PDA and PDA to CFG, Two stack PDA.

UNIT V TURING MACHINES (TM) **9**

Basic model, Definition and representation, Instantaneous Description, Language acceptance by TM, Computable functions, Types of Turing machines, Universal TM, Church's Thesis, Recursive and recursively enumerable languages, Halting problem, Introduction to Undecidability, Undecidable problems about TMs, Post correspondence problem (PCP), Modified PCP.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

At the end of the course the students will be able to

CO1: Design a finite automaton for a specific language.
CO2: Understand the regular expressions and its theorems.
CO3: Understand the basic properties of formal languages and grammars.
CO4: Differentiate regular, context-free and recursively enumerable languages.
CO5: Make grammars to produce strings from a specific language.
CO6: Acquire concepts relating to the theory of computation and computational models including decidability and intractability.

TEXT BOOKS:

1. J.E. Hopcroft, R. Motwani and J.D. Ullman, "Introduction to Automata Theory, Languages and Computations", Second Edition, Pearson Education, 2007.
2. Alfred V. Aho, Monica S.Lam, Ravi Sethi, Jeffrey D. Ullman, "Compilers: Principles, Techniques and Tools", Second Edition, Pearson Education, 2008

REFERENCE BOOKS:

1. J. Martin, "Introduction to Languages and the Theory of computation" Third Edition, Tata Mc Graw Hill, 2007.
2. Randy Allen, Ken Kennedy, "Optimizing Compilers for Modern Architectures: A Dependence based Approach", Morgan Kaufmann Publishers, 2002.
3. Steven S. Muchnick, "Advanced Compiler Design and Implementation", Morgan Kaufmann Publishers - Elsevier Science, India, Indian Reprint 2003.
4. Muneeswaran. K, "Compiler Design", Oxford University Press, 2012.

COs	**POs**												**PSOs**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
1	2	2	1	-	-	-	-	-	-	1	-	1	2	2	2
2	3	3	2	2	1	-	-	-	-	1	-	2	3	2	2
3	3	3	3	1	1	-	-	-	-	1	-	2	3	1	1
4	3	3	2	2	1	-	-	-	-	1	-	2	3	2	2
5	3	3	3	2	1	-	-	-	-	1	-	2	3	2	2
Overall Correlation	3	3	2	2	1	-	-	-	-	1	-	2	3	2	**2**

23IT403	COMPUTER ORGANIZATION AND ARCHITECTURE	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To explain principles of computer organization and the basic architectural concepts.
- To know about basic organization, design, and programming of a simple digital computer
- To explain the simple register transfer language to specify various computer operations.
- To explain about the computer arithmetic, instruction set design, microprogrammed control unit, pipelining and vector processing, memory organization and I/O systems, and multiprocessors

UNIT I BASIC STRUCTURE OF A COMPUTER SYSTEM 9

Functional Units – Basic Operational Concepts – Performance – Instructions: Language of the Computer – Operations, Operands – Instruction representation – Logical operations – decision making – MIPS Addressing.

UNIT II ARITHMETIC FOR COMPUTERS 9

Addition and Subtraction – Multiplication – Division – Floating Point Representation – Floating Point Operations – Sub word Parallelism

UNIT III PROCESSOR AND CONTROL UNIT 9

A Basic MIPS implementation – Building a Data path – Control Implementation Scheme – Pipelining – Pipelined data path and control – Types of Pipline - Handling Data Hazards & Control Hazards – Exceptions.

UNIT IV PARALLELISIM 9

Parallel processing challenges – Flynn's classification – SISD, SIMD, MISD MIMD, and Vector Architectures - Hardware multithreading – Multi-core processors and other Shared Memory Multiprocessors - Introduction to Graphics Processing Units, Clusters, Warehouse Scale Computers and other Message-Passing Multiprocessors.

UNIT V MEMORY & I/O SYSTEMS 9

Memory Hierarchy - memory technologies – cache memory – measuring and improving cache performance – virtual memory, TLB's – Accessing I/O Devices – Interrupts – Direct Memory Access – Bus structure – Bus operation – Arbitration – Interface circuits - USB.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

At the end of the course the students will be able to

CO1: Explain the basics structure of computers, operations and instructions.

CO2: Design arithmetic and logic unit.

CO3: Explain pipelined execution and design control unit.

CO4: Explain parallel processing architectures.

CO5: Explain the various memory systems and I/O communication.

TEXT BOOKS:

1. David A. Patterson and John L. Hennessy, Computer Organization and Design: The Hardware/Software Interface, Fifth Edition, Morgan Kaufmann / Elsevier, 2014.
2. Carl Hamacher, Zvonko Vranesic, Safwat Zaky and Naraig Manjikian, Computer Organization and Embedded Systems, Sixth Edition, Tata McGraw Hill, 2012.

REFERENCE BOOKS:

1. William Stallings, Computer Organization and Architecture – Designing for Performance, Eighth Edition, Pearson Education, 2010.
2. John P. Hayes, Computer Architecture and Organization, Third Edition, Tata McGraw Hill, 2012.
3. John L. Hennessey and David A. Patterson, Computer Architecture – A Quantitative Approach‖, Morgan Kaufmann / Elsevier Publishers, Fifth Edition, 2012.
4. Mano M. Moris, "Computer System Architecture", Pearson, 20219.

COs	**POs**												**PSOs**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
1	3	1	2	2	-	-	-	-	3	2	3	1	1	2	2
2	2	2	3	1	1	-	-	-	2	1	1	2	2	1	2
3	1	3	2	2	1	-	-	-	2	2	1	1	1	2	2
4	1	3	3	3	-	-	-	-	1	2	1	2	1	3	2
5	3	1	2	1	1	-	-	-	3	2	3	2	2	2	1
6	2	2	2	2	1				2	2	2	2	1	2	**2**
Overall correlation	3	1	2	2	-	-	-	-	3	2	3	1	1	2	2

23IT411 WEB TECHNOLOGY

L	T	P	C
3	0	2	4

COURSE OBJECTIVES:

- To understand about client-server communication and protocols used during communication.
- To design interactive web pages using Scripting languages.
- To design interactive web pages using Scripting languages.
- To develop web pages using XML/XSLT

UNIT I WEBSITE BASICS AND HTML **9**

Web Essentials: Clients, Servers, and Communication. The Internet-Basic Internet Protocols -The World Wide Web-HTTP request message-response message-Web Clients Web Servers. Markup Languages: XHTML. An Introduction to HTML History-Versions-Basic n XHTML Syntax and Semantics- Some Fundamental HTML Elements-Relative URLs-Lists-tables-Frames-Forms-HTML 5.0., DHTML

UNIT II CSS AND CLIENT SIDE SCRIPTING **9**

Style Sheets: CSS-Introduction to Cascading Style Sheets-Features-Core Syntax-Style Sheets and HTML- Style Rule Cascading and Inheritance-Text Properties-Box Model Normal Flow Box Layout- Beyond the Normal Flow-CSS3.0. Client-Side Programming: The JavaScript Language-History and Versions Introduction JavaScript in Perspective-Syntax-Variables and Data Types-Statements- Operators-Literals-Functions-Objects-Arrays-Built-in Objects-JavaScript Debuggers.

UNIT III INTRODUCTION TO PHP **10**

Declaring variables, data types, arrays, strings, operations, expressions, control structures, functions, Reading data from web form controls like Text Boxes, radio buttons, lists etc., Handling File Uploads, Connecting to database (My SQL as reference), executing simple queries, handling results, Handling sessions and cookies. File Handling in PHP: File operations like opening, closing, reading, writing, appending, deleting etc.on text and binary files, listing directories.

UNIT IV DOCUMENT OBJECT MODEL **8**

DOM-Introduction to the Document Object Model DOM History and Levels-Intrinsic Event Handling-Modifying Element Style-The Document Tree-DOM Event Handling - Accommodating Noncompliant Browsers Properties of window-Case Study.

UNIT V XML **9**

XML-Documents and Vocabularies-Versions and Declaration - Namespaces JavaScript and XML: Ajax-DOM based XML processing Event-oriented Parsing: SAX-Transforming XML Documents-Selecting XML Data:XPATH-Template based Transformations: XSLT-Displaying XML Documents in Browsers.

TOTAL: 45 PERIODS

LIST OF EXPERIMENTS

1. Create a web page with the following using HTML.
   - **a.** To embed an image map in a web page.
   - **b.** To fix the hot spots.
   - **c.** Show all the related information when the hot spots are clicked
2. Create a web page with all types of Cascading style sheets.
3. Client Side Scripts for Validating Web Form Controls using DHTML.
4. Installation of Apache Tomcat web server.
5. Write programs in Java using Servlets:
   - **a.** To invoke servlets from HTML forms.
   - **b.** Session Tracking.
6. Write programs in Java to create three-tier applications using JSP and Databases
   - **a.** For conducting on-line examination.
   - **b.** For displaying student mark list. Assume that student information is available in a database which has been stored in a database server.
7. Programs using XML – Schema – XSLT/XSL.
8. Programs using DOM and SAX parsers.
9. Programs using AJAX.
10. Consider a case where we have two web Services- an airline service and a travel agent and the travel agent is searching for an airline. Implement this scenario using Web Services and Data base.

COURSE OUTCOMES:

At the end of the course the students will be able to

CO1: Design simple web pages using markup languages like HTML and XHTML.
CO2: Create dynamic web pages using DHTML and java script that is easy to navigate and use.
CO3: Program server side web pages that have to process request from client side web pages.
CO4: Represent web data using XML and develop web pages using JSP.
CO5: Understand various web services and how these web services interact.

TEXT BOOK:

Jeffrey C. Jackson, "Web Technologies--A Computer Science Perspective", Pearson Education, 2006.

REFERENCE BOOKS:

1. Robert. W. Sebesta, "Programming the World Wide Web", Fourth Edition, Pearson Education, 2007.
2. Deitel, Deitel, Goldberg, "Internet & World Wide Web How to Program", Third Edition, Pearson Education, 2006.
3. Marty Hall and Larry Brown," Core Web Programming" Second Edition, Volume I and II, Pearson Education, 2001.
4. Bates, "Developing Web Applications", Wiley, 2006

COs	POs												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	3	2	3	2	3	2	0	0	2	2	2	3	3	2	1
2	3	3	3	3	3	2	0	0	2	0	2	3	3	2	1
3	3	3	3	2	3	2	0	0	2	2	2	3	3	2	1
4	3	3	3	3	3	1	0	0	1	1	2	3	3	2	1
5	3	3	3	3	3	1	0	0	0	0	2	3	3	2	1
6	3	3	3	3	3	2	0	0	2	1	2	3	3	2	1
Overall Correlation	3	2	3	2	3	2	0	0	2	2	2	3	3	2	1

23IT421 MACHINE LEARNING LABORATORY

L	T	P	C
0	0	2	4

COURSE OBJECTIVES:

- To analyze the big data using various techniques
- To perform mining on streaming data
- To familiarize the framework to manage huge data with different tools like hadoop, spark
- To use big data for business applications with various hadoop integration tools
- Learn the basics of deep learning using neural networks

LIST OF EXPERIMENTS:

1. Basics of data analysis.
2. Extract the data from database using python.
3. Implement k-nearest neighbours classification using python
4. Work with neural networks.
5. Implementation of cluster analysis for given data.
6. Write a program to implement the naïve Bayesian classifier for a sample training data.
7. Set stored as a .CSV file. Compute the accuracy of the classifier, considering few test data sets.
8. Implement linear regression using python.
9. Implement Naïve Bayes theorem to classify the English text.
10. Implement the finite words classification system using Back-propagation algorithm.

TOTAL : 45 PERIODS

COURSE OUTCOMES:

At the end of the course the students will be able to

CO1: Apply various techniques to manage big data
CO2: Apply various techniques for mining data stream
CO3: Apply Hadoop and its integration tools for big data applications
CO4: Build Data Visualization models
CO5: Build deep learning neural network models

COs	POs												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	3	2	3	3	-	-	-	-	1	3	3	3	1	2	2
2	1	1	1	3	1	-	-	-	1	2	1	3	2	3	2
3	2	1	2	1	1	-	-	-	2	1	1	3	1	1	1
4	3	1	3	1	-	-	-	-	2	1	2	1	2	2	2
5	3	1	1	2	2	-	-	-	3	1	2	3	2	1	2
Overall Correlation	2	1	2	2	1	-	-	-	2	2	2	3	2	2	2

23CS421 OPERATING SYSTEMS LABORATORY

	L	T	P	C
	0	0	2	4

COURSE OBJECTIVES:

- To install windows operating systems.
- To understand the basics of Unix command and shell programming.
- To implement various CPU scheduling algorithms.
- To implement Deadlock Avoidance and Deadlock Detection Algorithms
- To be familiar with File Organization and File Allocation Strategies.
- To be understand the working virtual machine.

LIST OF EXPERIMENTS :

1. Installation of windows operating system
2. Illustrate UNIX commands and Shell Programming
3. Process Management using System Calls : Fork, Exit, Getpid, Wait, Close
4. Write a C program to simulate producer-consumer problem using semaphores
5. Write a C program to simulate the concept of Dining-Philosophers problem.
6. To work with inter process communication using pipe.
7. Write a C program that takes one or more file/directory names as command line input and reports following information A) File Type B) Number Of Links C) Time of last Access D) Read, write and execute permissions
8. To write C program to organize the file using single level directory.
9. To write C program to organize the file using two level directory.
10. Mount a USB drive to a specific directory and verify its contents on a Linux system.
11. Configure auto mount for a network share and verify seamless access on multiple client machines.
12. Install any guest operating system like Linux using VMware.
13. Create and mount an encrypted file system, ensuring data security, on a virtual machine

TOTAL : 45 PERIODS

COURSE OUTCOMES:

At the end of the course the students will be able to

CO1: Execute basic UNIX commands and shell programming

CO2: Implement process synchronization concepts

CO3: Implement the concept of interprocess communication

CO4: Implement file systems, including local file systems and network file systems (NFS)

CO5: Implement operations on directories.

CO6: Execute data security on virtual machines

COs	POs												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	3	3	3	3	3	2	1	1	2	2	-	1	3	3	-
2	3	3	3	3	3	2	1	1	2	2	-	1	3	3	-
3	3	3	3	3	3	2	1	1	2	2	-	1	3	3	-
4	3	3	3	3	3	2	1	1	2	2	-	1	3	3	-
5	3	3	3	3	3	2	1	1	2	2	-	1	3	3	-
6	3	3	3	3	3	2	1	1	2	2		1	3	3	-
Overall correlation	3	3	3	3	3	3	2	2	3	3	-	1	3	3	-

23ES491 APTITUDE AND LOGICAL REASONING –I

	L	T	P	C
	0	**0**	**2**	**1**

COURSE OBJECTIVES:

- To improve the problem solving and logical thinking ability of the students.
- To acquaint student with frequently asked questions and patterns in quantitative aptitude and logical reasoning.

UNIT I **4**

Numbers, LCM, HCF, Averages, Ratio & Proportion, Mixtures & Allegation.

UNIT II **4**

Percentages, Time and work, Pipes and Cistern, coding and decoding

UNIT III **4**

Time Speed Distance, Train, Boats and Streams, Analogy

UNIT IV **4**

Data Interpretation(BAR,PIE,LINE), Seating arrangement

UNIT V **4**

Simple Interest and Compound Interest, Profit loss and Discount, Partnership,

TOTAL: 45 PERIODS

COURSE OUTCOMES:

At the end of the course the students will be able to

CO 1 Understand the basic concepts of quantitative ability

CO 2 Understand the basic concepts of logical reasoning Skills

CO 3 Increase in critical thinking skills

CO 4 Able to solve campus placements aptitude papers covering Quantitative Ability, Logical Reasoning Ability

TEXT BOOK:

APTIPEDIA, 2nd edition, Wiley Publishers

REFERENCE BOOKS:

1. Quantitative Aptitude – R.S. Agarwal
2. A Modern Approach To Verbal & Non-Verbal Reasoning By R S Agarwal

KCG COLLEGE OF TECHNOLOGY
(AUTONOMOUS)
REGULATIONS 2023
B.E. MECHANICAL ENGINEERING
CHOICE BASED CREDIT SYSTEM
CURRICULA FOR SEMESTERS I TO VIII

SEMESTER – I

SL. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
	23IP101	Induction Programme		-	-	-	-	-
THEORY								
1	23HS101	Essential Communication	HSMC	3	0	0	3	3
2	23MA101	Matrices and Calculus	BSC	3	0	0	3	3
3	23AD101	Programming in Python	ESC	3	0	0	3	3
4	23HS102	Heritage of Tamils	HSMC	1	0	0	1	1
THEORY AND PRACTICALS								
5	23PH111	Engineering Physics	BSC	3	0	2	5	4
6	23CY111	Engineering Chemistry	BSC	3	0	2	5	4
PRACTICALS								
7	23AD121	Python Programming Laboratory	ESC	0	0	4	4	2
8	23HS121	Communication Skills Laboratory	HSMC	0	0	2	2	1
9	23HS122	General Clubs / Technical Clubs / NCC / NSS / Extension Activities	HSMC	0	0	2	2	1*
TOTAL				16	0	12	28	21

SEMESTER – II

SL. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
THEORY								
1	23HS201/ 23HS202	Professional English/ Foreign Language	HSMC	3	0	0	3	3
2	23MA203	Statistics and Numerical Methods	BSC	3	1	0	4	4
3	23PH206	Materials Science	BSC	3	0	0	3	3
4	23ME201	Applied Mechanics	PCC	3	0	0	3	3
5	23HS203	Tamils and Technology	HSMC	1	0	0	1	1
THEORY AND PRACTICALS								
6	23EE281	Basic Electrical and Electronics Engineering	ESC	2	0	2	4	3
7	23ME211	Engineering Graphics	ESC	3	0	2	5	4
PRACTICALS								
8	23ME221	Engineering Practices Laboratory	ESC	0	0	4	4	2
9	23ME222	Applied Mechanics Laboratory	PCC	0	0	4	4	2
10	23ES291	Soft Skills	EEC	0	0	2	2	1*
TOTAL				18	1	14	33	25

SEMESTER III

SL. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
THEORY								
1	23MA302	Transforms and Partial Differential Equations	BSC	3	1	0	4	4
2	23ME301	Engineering Thermodynamics	PCC	3	0	0	3	3
3	23ME302	Engineering Materials and Metallurgy	PCC	3	0	0	3	3
4	23HS301	Universal Human Values and Ethics	HSMC	3	0	0	3	3
THEORY AND PRACTICALS								
5	23ME311	Manufacturing Processes	PCC	3	0	2	5	4
6	23ME312	Fluid Mechanics and Hydraulic Machinery	PCC	3	0	2	5	4
PRACTICALS								
7	23ME321	Computer Aided Machine Drawing Laboratory	PCC	0	0	4	4	2
8	23ES391	Presentation Skills	EEC	0	0	2	2	1*
TOTAL				18	1	10	29	23

SEMESTER IV

SL. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
THEORY								
1	23MA401	Optimization Techniques	BSC	3	1	0	4	4
2	23ME401	Thermal Engineering	PCC	3	0	0	3	3
3	23ME402	Theory of Machines	PCC	3	1	0	4	4
4		Department Elective 1	DEC	3	0	0	3	3
5		Department Elective 2	DEC	3	0	0	3	3
THEORY AND PRACTICALS								
6	23CE412	Strength of Materials	PCC	3	0	2	5	4
PRACTICALS								
7	23ME421	Thermal Engineering Laboratory	PCC	0	0	4	4	2
8	23ME422	Kinematics and Dynamics Laboratory	PCC	0	0	4	4	2
9	23ES491	Aptitude and Logical Reasoning - 1	EEC	0	0	2	2	1*
10	23ME423/ 23ME424	Mini Project -1/ In-Plant Training - 1	EEC	0	0	0	0	1
TOTAL				18	2	12	32	26

SEMESTER V

SL. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
THEORY								
1	23RE501	Research Methodology and Intellectual Property Rights	ESC	2	0	0	2	2
2	23ME501	Design of Machine Elements	PCC	3	0	0	3	3
3	23ME502	Heat and Mass Transfer	PCC	3	0	0	3	3
4		Department Elective 3	DEC	3	0	0	3	3
5		Non-Department Elective - 1 (Emerging Technology)	NEC	3	0	0	3	3
THEORY AND PRACTICALS								
6	23ME511	Engineering Metrology and Measurements	PCC	3	0	2	5	4
PRACTICALS								
7	23ME521	Heat Transfer Laboratory	PCC	0	0	4	4	2
8	23ME522/ 23ME523	Mini Project - 2/ In-Plant Training - 2	EEC	0	0	4	4	2
9	23ES591	Aptitude and Logical Reasoning - 2	EEC	0	0	2	2	1*
TOTAL				17	0	12	29	22

SEMESTER VI

SL. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
THEORY								
1		Department Elective 4	DEC	3	0	0	3	3
2		Department Elective 5	DEC	3	0	0	3	3
3		Non-Department Elective - 2 (Management /Safety Courses)	NEC	3	0	0	3	3
THEORY AND PRACTICALS								
4	23CE611	Environmental Sciences and Engineering	ESC	3	0	2	5	4
5	23ME611	CAD/CAM	PCC	3	0	2	5	4
6	23ME612	Finite Element Analysis	PCC	3	0	2	5	4
PRACTICALS								
7	23ME621	Project Work - Phase 1	EEC	0	0	4	4	2
8	23ME622	Technical Training	EEC	0	0	2	2	1
9	23ES623	Technical Seminar - 1	ESC	0	0	2	2	1
TOTAL				18	0	14	32	25

SEMESTER VII

SL. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
THEORY								
1		Department Elective 6	DEC	3	0	0	3	3
2		Non-Department Elective - 3 (Management Courses)	NEC	3	0	0	3	3
3	23ME701	Fluid Power Automation	PCC	3	0	0	3	3
4	23ME702	Comprehension	EEC	2	0	0	2	2
THEORY AND PRACTICALS								
5	23ME711	Mechatronics & IOT	PCC	3	0	2	5	4
PRACTICALS								
6	23ME721	Project Work - Phase 2	EEC	0	0	6	6	3
7	23ME722	Technical Seminar - 2	ESC	0	0	4	4	2
TOTAL				14	0	12	26	20

SEMESTER VIII

SL. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
PRACTICALS								
1	23ME821/ 23ME822	Internship / Capstone Project	EEC	0	0	20	20	10
TOTAL				0	0	20	20	10

TOTAL CREDITS: 172

DEPARTMENT ELECTIVE COURSES

VERTICAL 1: MANUFACTURING ENGINEERING

SL. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1	23ME031	Additive Manufacturing	DEC	3	0	0	3	3
2	23ME032	Digital Manufacturing and IOT	DEC	3	0	0	3	3
3	23ME033	Computer Integrated Manufacturing	DEC	3	0	0	3	3
4	23ME034	Non-traditional Machining Processes	DEC	3	0	0	3	3
5	23ME035	Process Planning and Cost Estimation	DEC	3	0	0	3	3
6	23ME036	Non-Destructive Testing and Evaluation	DEC	3	0	0	3	3
7	23ME037	Design for Manufacturing	DEC	3	0	0	3	3
8	23ME038	Quality Control and Reliability Engineering	DEC	3	0	0	3	3

VERTICAL 2: COMPUTATIONAL ENGINEERING

SL. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1	23ME039	Design Concepts in Engineering	DEC	3	0	0	3	3
2	23ME040	Design of Transmission Systems	DEC	3	0	0	3	3
3	23ME041	Product Design and Development	DEC	3	0	0	3	3
4	23ME042	Computational Fluid Dynamics and Heat Transfer	DEC	3	0	0	3	3
5	23MT057	Machine Learning for Intelligent Systems	DEC	3	0	0	3	3
6	23ME044	Mechanical System Design	DEC	3	0	0	3	3
7	23ME045	Computational Bio-Mechanics	DEC	3	0	0	3	3
8	23ME046	Ergonomics in Design	DEC	3	0	0	3	3

VERTICAL 3: THERMAL SCIENCES

SL. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1	23ME047	Power Plant Engineering	DEC	3	0	0	3	3
2	23ME048	Refrigeration and Air-Conditioning	DEC	3	0	0	3	3
3	23ME049	Renewable Energy Technologies	DEC	3	0	0	3	3
4	23ME050	Bioenergy Conversion Technologies	DEC	3	0	0	3	3
5	23ME051	Thermal Management of Batteries and Fuel Cells	DEC	3	0	0	3	3
6	23MT047	Automobile Engineering	DEC	3	0	0	3	3
7	23ME053	Energy Storage Devices	DEC	3	0	0	3	3
8	23ME054	Energy Conservation in Industries	DEC	3	0	0	3	3

VERTICAL 4: MODERN MOBILITY SYSTEMS

SL. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1	23ME055	Hybrid and Electric Vehicle Technology	DEC	3	0	0	3	3
2	23ME056	Energy Storage and Management System for Electric Vehicles	DEC	3	0	0	3	3
3	23ME057	Vehicle Control Systems	DEC	3	0	0	3	3
4	23ME058	Vehicle Dynamics and Controls	DEC	3	0	0	3	3
5	23ME059	Electric Vehicle Design	DEC	3	0	0	3	3
6	23ME060	Vehicle Health Monitoring, Maintenance and Safety	DEC	3	0	0	3	3
7	23ME061	Conventional and Futuristic Vehicle Technology	DEC	3	0	0	3	3
8	23ME062	Automotive Materials, Components, Design & Testing	DEC	3	0	0	3	3

VERTICAL 5: ROBOTICS AND AUTOMATION

SL. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1	23MT402	Sensors and Instrumentation	DEC	3	0	0	3	3
2	23MT311	Electrical Drives and Actuators	DEC	3	0	0	3	3
3	23ME065	Robotics	DEC	3	0	0	3	3
4	23ME066	Digital Twin and Industry 5.0	DEC	3	0	0	3	3
5	23ME067	Agricultural Robotics and Automation	DEC	3	0	0	3	3
6	23ME068	Robots and Systems in Smart Manufacturing	DEC	3	0	0	3	3
7	23ME069	Total Integrated Automation	DEC	3	0	0	3	3
8	23AE072	Drone Technologies	DEC	3	0	0	3	3

NON-DEPARMENT ELECTIVE

EMERGING TECHNOLOGY

SL NO	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1	23NE971	Quantum Technology	NEC	3	0	0	3	3
2	23NE972	Block Chain Technology	NEC	3	0	0	3	3
3	23NE973	Artificial Intelligence and Machine Learning Fundamentals	NEC	3	0	0	3	3
4	23NE974	Augmented Reality and Virtual Reality	NEC	3	0	0	3	3
5	23NE975	IoT concepts and applications	NEC	3	0	0	3	3
6	23NE976	Data Science and Fundamentals	NEC	3	0	0	3	3
7	23NE990	Big Data Analytics	NEC	3	0	0	3	3

MANAGEMENT COURSES

SL NO	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1	23HS971	Total Quality Management	NEC	3	0	0	3	3
2	23HS972	Engineering Economics and Financial Accounting	NEC	3	0	0	3	3
3	23HS973	Engineering Management and Law	NEC	3	0	0	3	3
4	23HS974	Knowledge Management	NEC	3	0	0	3	3
5	23HS975	Industrial Management	NEC	3	0	0	3	3
6	23HS976	Entrepreneurship and Business Opportunities	NEC	3	0	0	3	3
7	23HS977	Modern Business Administration and Financing	NEC	3	0	0	3	3
8	23HS978	Essentials of Management	NEC	3	0	0	3	3

SAFETY COURSES

SL NO	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1	23HS979	Disaster Management	NEC	3	0	0	3	3
2	23HS980	Industrial Safety	NEC	3	0	0	3	3
3	23HS981	Automotive Safety	NEC	3	0	0	3	3

SUMMARY OF CREDIT DISTRIBUTION SEMESTER-WISE

SEMESTER	HSMC	BSC	ESC	PCC	DEC	NEC	EEC	Total
Semester I	5	11	5	-	-	-	-	**21**
Semester II	4	7	9	5	-	-	-	**25**
Semester III	3	4	-	16	-	-	-	**23**
Semester IV	-	4	-	15	6	-	1	**26**
Semester V	-	-	2	12	3	3	2	**22**
Semester VI	-	-	5	8	6	3	3	**25**
Semester VII	-	-	2	7	3	3	5	**20**
Semester VIII	-	-	-	-	-	-	10	**10**
Mechanical Department	**12**	**26**	**23**	**63**	**18**	9	21	**172**

23MA302	TRANSFORMS AND PARTIAL DIFFERENTIAL EQUATIONS	L	T	P	C
		3	1	0	4

COURSE OBJECTIVES:

- To introduce the basic concepts of PDE for solving standard partial differential equations.
- To introduce Fourier series analysis which is central to many applications in engineering apart from its use in solving boundary value problems.
- To acquaint the student with Fourier series techniques in solving heat flow problems used in various situations.
- To acquaint the student with Fourier transform techniques used in wide variety of situations.
- To introduce the effective mathematical tools for the solutions of partial differential equations that model several physical processes and to develop Z transform techniques for discrete time systems.

UNIT I PARTIAL DIFFERENTIAL EQUATIONS 9+3

Formation of partial differential equations –Solutions of standard types of first order partial differential equations - Lagrange's linear equation - Linear partial differential equations of second and higher order with constant coefficients of both homogeneous and non-homogeneous types.

UNIT II FOURIER SERIES 9+3

Dirichlet's conditions – General Fourier series – Odd and even functions – Half range sine series and cosine series – Root mean square value – Parseval's identity – Harmonic analysis.

UNIT III APPLICATIONS OF PARTIAL DIFFERENTIAL EQUATIONS 9+3

Classification of second order Quasi Linear PDE – Method of separation of variables - Fourier series solutions of one dimensional wave equation – One dimensional equation of Heat conduction – Steady state solution of two dimensional equation of heat conduction (Infinite) (Cartesian coordinates only).

UNIT IV FOURIER TRANSFORMS 9+3

Statement of Fourier integral theorem– Fourier transform pair – Fourier sine and cosine transforms – Properties – Transforms of simple functions – Convolution theorem (Without proof) – Parseval's identity.

UNIT V Z-TRANSFORMS AND DIFFERENCE EQUATIONS 9+3

Z-transforms - Elementary properties – Convergence of Z-transforms – Initial and final value theorems - Inverse Z-transform using partial fraction and convolution theorem - Formation of difference equations – Solution of difference equations using Z - transforms.

TOTAL: 60 PERIODS

COURSE OUTCOMES:

At the end of the course the students will be able to

CO 1 Understand how to solve the given standard partial differential equations.

CO 2 Understand Fourier series analysis which plays a vital role in engineering applications.

CO 3 Examine the physical significance of Fourier series techniques in solving one and two dimensional heat flow problems and one dimensional wave equations.

CO 4 Understand the mathematical principles on Fourier transforms to solve some of the physical problems of engineering.

CO 5 Understand Z transforms , inverse Z transforms and its elementary properties

CO 6 Apply the effective mathematical tools for the solutions of difference equations by using Z transform techniques for discrete time systems.

TEXT BOOKS:

1. Kreyszig.E, "Advanced Engineering Mathematics", John Wiley and Sons, 10^{th} Edition, New Delhi, 2016.
2. Grewal.B.S., "Higher Engineering Mathematics", Khanna Publishers, New Delhi, 44^{th} Edition, 2018.
3. P.Sivaramakrishna Das and C.Vijayakumari "A Text Book on TPDE" Pearson Publications.

REFERENCE BOOKS:

1. Narayanan. S., Manicavachagom Pillay.T.K and Ramanaiah.G "Advanced Mathematics for Engineering Students", Vol. II & III, S.Viswanathan Publishers Pvt. Ltd, Chennai, 1998.
2. Ramana. B.V., "Higher Engineering Mathematics", McGraw Hill Education Pvt. Ltd, New Delhi, 2018.

COs	**POs**												**PSOs**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
1	3	3	3	-	-	-	-	-	-	-	-	2	2	-	1
2	3	3	3	-	-	-	-	-	-	-	-	2	2	-	1
3	2	2	2	-	-	-	-	-	-	-	-	2	2	-	1
4	3	3	3	-	-	-	-	-	-	-	-	2	2	-	1
5	2	2	2	-	-	-	-	-	-	-	-	2	2	-	1
6	2	2	2	-	-	-	-	-	-	-	-	2	2	-	1
Overall correlation	3	3	2	-	-	-	-	-	-	-	-	2	2	-	1

23ME301	ENGINEERING THERMODYNAMICS	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- Impart knowledge on the basics and application of zeroth and first law of thermodynamics.
- Impart knowledge on the second law of thermodynamics in analysing the performance of thermal devices.
- Impart knowledge on availability and applications of second law of thermodynamics.
- Teach the various properties of steam through steam tables and Mollier chart.
- Impart knowledge on the macroscopic properties of ideal and real gases.

UNIT I BASICS, ZEROTH AND FIRST LAW 9

Review of Basics – Thermodynamic systems, Properties and processes Thermodynamic Equilibrium -Displacement work - P-V diagram. Thermal equilibrium - Zeroth law – Concept of temperature and temperature Scales. First law – application to closed and open systems – steady and unsteady flow processes.

UNIT II SECOND LAW AND ENTROPY 9

Heat Engine – Refrigerator - Heat pump. Statements of second law and their equivalence & corollaries. Carnot cycle - Reversed Carnot cycle - Performance - Clausius inequality. Concept of entropy - T-s diagram – Tds Equations - Entropy change for a pure substance.

UNIT III AVAILABILITY AND APPLICATIONS OF II LAW 9

Ideal gases undergoing different processes - principle of increase in entropy. Applications of II Law. High and low-grade energy. Availability and Irreversibility for open and closed system processes - I and II law Efficiency.

UNIT IV PROPERTIES OF PURE SUBSTANCES 10

Steam - formation and its thermodynamic properties - p-v, p-T, T-v, T-s, h-s diagrams. PVT surface.Determination of dryness fraction. Calculation of work done and heat transfer in non-flow and flow processes using Steam Table and Mollier Chart.

UNIT V GAS MIXTURES AND THERMODYNAMIC RELATIONS 8

Properties of Ideal gas, real gas - comparison. Equations of state for ideal and real gases. vander Waal's relation - Reduced properties - Compressibility factor - Principle of Corresponding states – Generalized Compressibility Chart. Maxwell relations - TdS Equations - heat capacities relations - Energy equation, Joule-Thomson experiment - Clausius-Clapeyron equation.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

At the end of the course the students will be able to

CO1: Apply the basics of thermodynamic systems and equilibrium.

CO2: Apply the zeroth and first law of thermodynamics by formulating temperature scales and calculating the property changes in closed and open engineering systems.

CO3: Apply the second law of thermodynamics in analysing the performance of thermal devices through energy and entropy calculations.

CO4: Apply the second law of thermodynamics in evaluating the various properties of steam through steam tables and Mollier chart.

CO5: Apply the properties of pure substance in computing the macroscopic properties of ideal and real gases using gas laws and appropriate thermodynamic relations.

CO6: Apply the properties of gas mixtures in calculating the properties of gas mixtures and applying various thermodynamic relations to calculate property changes.

TEXT BOOKS:

1. Nag .P.K., "Engineering Thermodynamics", 6th Edition, Tata McGraw Hill (2017), New Delhi.
2. Natarajan, E., "Engineering Thermodynamics: Fundamentals and Applications", 2nd Edition (2014), Anuragam Publications, Chennai.

REFERENCE BOOKS:

1. Cengel, Y and M. Boles, Thermodynamics - An Engineering Approach, Tata McGraw Hill, 9th Edition, 2019.
2. Chattopadhyay, P, "Engineering Thermodynamics", 2nd Edition Oxford University Press, 2016.
3. Rathakrishnan, E., "Fundamentals of Engineering Thermodynamics", 2nd Edition, Prentice Hall of India Pvt. Ltd, 2006.
4. Claus Borgnakke and Richard E. Sonntag, "Fundamentals of Thermodynamics", 10th Edition, Wiley Eastern, 2019.
5. Venkatesh. A, "Basic Engineering Thermodynamics", Universities Press (India) Limited, 2007

COs	POs												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	3	3	2	1	-	-	-	-	-	-	-	2		-	-
2	3	3	2	1	-	-	-	-	-	-	-	2		-	-
3	3	3	2	1	-	-	-	-	1	-	1	2	3	-	3
4	3	3	2	1	-	1	-	-	2	-	1	2	3	2	-
5	3	3	2	1	-	1	-	-	2	-	1	2	3	2	3
6	3	3	2	1	-	1	-	-	2	-	1	2	3	2	3
Overall correlation	3	3	3	1	-	1	-	-	2	-	1	2	3		1

23ME302 ENGINEERING MATERIALS AND METALLURGY

L	T	P	C
3	0	0	3

COURSE OBJECTIVES:

- Construct the phase diagram and to use iron-iron carbide phase diagram for microstructure formation.
- Select and apply various heat treatment processes and its microstructure formation.
- Illustrate the different types of ferrous and non-ferrous alloys and their uses in engineering field.
- Illustrate the different polymer, ceramics and composites and their uses in engineering field.
- Various testing procedures and failure mechanism in engineering field.

UNIT I CONSTITUTION OF ALLOYS AND PHASE DIAGRAMS 9

Constitution of alloys – Solid solutions, substitutional and interstitial – phase diagrams, Isomorphous, eutectic, eutectoid, peritectic, and peritectoid reactions, Iron – Iron carbide equilibrium diagram. Classification of steel and cast-Iron microstructure, properties and application.

UNIT II HEAT TREATMENT 9

Definition – Full annealing, stress relief, recrystallisation and spheroidising –normalizing, hardening and tempering of steel. Isothermal transformation diagrams – cooling curves superimposed on I.T. diagram – continuous cooling Transformation (CCT) diagram – Austempering, Martempering – Hardenability, Jominy end quench test - case hardening, carburizing, Nitriding, cyaniding, carbonitriding – Flame and nduction hardening – Vacuum and Plasma hardening – Thermo-mechanical treatments- elementary ideas on sintering.

UNIT III FERROUS AND NON-FERROUS METALS 9

Effect of alloying additions on steel (Mn, Si, Cr, Mo, Ni, V,Ti& W) – stainless and tool steels – HSLA - Maraging steels – Grey, white, malleable, spheroidal – alloy cast irons, Copper and its alloys – Brass, Bronze and Cupronickel – Aluminum and its alloys; Al-Cu – precipitation strengthening treatment – Titanium alloys, Mg-alloys, Ni-based super alloys – shape memory alloys- Properties and Applications - overview of materials standards.

UNIT IV NON-METALLIC MATERIALS 9

Polymers – types of polymers, commodity and engineering polymers – Properties and applications of PE, PP, PS, PVC, PMMA, PET, PC, PA, ABS, PAI, PPO, PPS, PEEK, PTFE, Thermoset polymers – Urea and Phenol formaldehydes – Nylon, Engineering Ceramics – Properties and applications of Al2O3, SiC, Si3N4, PSZ and SIALON – intermetallics-Composites- Matrix and reinforcement Materials - applications of Composites - Nano composites.

UNIT V MECHANICAL PROPERTIES AND DEFORMATION MECHANISMS **9**

Mechanisms of plastic deformation, slip and twinning – Types of fracture – fracture mechanics- Griffith's theory- Testing of materials under tension, compression and shear loads – Hardness tests (Brinell, Vickers and Rockwell), Micro and nano-hardness tests, Impact test lzod and charpy, fatigue and creep failure mechanisms.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

At the end of the course the students will be able to

CO1:explain alloys and phase diagram, Iron-Iron carbon diagram and steel classification.

CO2:demonstrate knowledge on isothermal transformation, continuous cooling diagrams and different heat treatment processes.

CO3: identify the effect of alloying elements on ferrous and non-ferrous metals.

CO4: summarize the properties and applications of non-metallic materials.

CO5: explain the testing of mechanical properties.

CO6: gain knowledge on deformation mechanisms.

TEXT BOOKS:

1. Kenneth G.Budinski and Michael K. Budinski, "Engineering Materials", Prentice Hall of India Private Limited, 9th edition, 2018.
2. Sydney H.Avner, "Introduction to Physical Metallurgy", McGraw Hill Book Company, 1994.

REFERENCE BOOKS:

1. A. Alavudeen, N. Venkateshwaran, and J. T.WinowlinJappes, A Textbook of Engineering Materials and Metallurgy, Laxmi Publications, 2006.
2. Amandeep Singh Wadhwa, andHarvinder Singh Dhaliwal, A Textbook of Engineering Material and Metallurgy, University Sciences Press, 2008.
3. G.S. Upadhyay and Anish Upadhyay, "Materials Science and Engineering", Viva Books Pvt.Ltd, New Delhi, 2020.
4. Raghavan.V, "Materials Science and Engineering", Prentice Hall of India Pvt.Ltd. 6th edition, 2019.
5. Williams D Callister, "Material Science and Engineering" Wiley India Pvt Ltd, 2nd edition Re print 2019.

COs	POs												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	3	1	3	1	-	-	-	-	-	-	-	2	2	2	1
2	3	1	3	1	-	1	-	1	-	-	-	2	2	2	1
3	3	1	3	-	-	-	-	-	-	-	-	2	2	2	1
4	3	1	3	-	-	-	1	-	-	-	-	2	2	2	1
5	3	1	3	-	1	-	-	-	-	-	-	2	2	2	1
6	3	1	3	-	1	-	-	-	-	-	-	2	2	2	1
Overall correlation	3	1	3	1	1	1	1	1	-	-	-	2	2	2	1

23HS301	UNIVERSAL HUMAN VALUES AND ETHICS	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- Development of a holistic perspective based on self-exploration about themselves (human being), family, society and nature/existence.
- Understanding (or developing clarity) of the harmony in the human being, family, society and nature/existence.
- Strengthening of self-reflection.
- Development of commitment and courage to act.

UNIT I COURSE INTRODUCTION 9

Need, Basic Guidelines, Content and Process for Value Education - Understanding the need, basic guidelines, content and process for Value Education -Self Exploration–what is it? - its content and process; 'Natural Acceptance' and Experiential Validation- as the mechanism for self exploration - Continuous Happiness and Prosperity- A look at basic Human Aspirations -Right understanding, Relationship and Physical Facilities- the basic requirements for fulfilment of aspirations of every human being with their correct priority -Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario -Method to fulfil the above human aspirations: understanding and living in harmony at various levels.

UNIT II UNDERSTANDING HARMONY IN THE HUMAN BEING 9

Harmony in Myself- Understanding human being as a co-existence of the sentient 'I' and the material 'Body' -Understanding the needs of Self ('I') and 'Body' - Sukh and Suvidha- Understanding the Body as an instrument of 'I' (I being the doer, seer and enjoyer) - Understanding the characteristics and activities of 'I' and harmony in 'I' -Understanding the harmony of I with the Body: Sanyam and Swasthya; correct appraisal of Physical needs, meaning of Prosperity.

UNIT III UNDERSTANDING HARMONY IN THE FAMILY AND SOCIETY 9

Harmony in Human-Human Relationship -Understanding Harmony in the family – the basic unit of human interaction -Understanding values in human-human relationship; meaning of Nyaya and program for its fulfilment to ensure satisfaction; Trust(Vishwas) and Respect as the foundational values of relationship -Understanding the meaning of Vishwas; Difference between intention and competence -Understanding the meaning of Samman, Difference between respect and differentiation; the other salient values in relationship -Understanding the harmony in the society (society being an extension of family)-Visualizing a universal harmonious order in society- Undivided Society (Akhand Samaj), Universal Order- from family to world family.

UNIT IV ENGINEERING ETHICS **9**

Senses of ‗Engineering Ethics„ – Variety of moral issues – Types of inquiry – Moral dilemmas – Moral Autonomy – Kohlberg's theory – Gilligan's theory – Consensus and Controversy – Models of professional roles - Theories about right action – Self-interest – Customs and Religion – Uses of Ethical Theories.

UNIT V SAFETY, RESPONSIBILITY AND RIGHTS **9**

Safety and Risk – Assessment of Safety and Risk – Risk Benefit Analysis and Reducing Risk - Respect for Authority – Collective Bargaining – Confidentiality – Conflicts of Interest – Occupational Crime – Professional Rights – Employee Rights – Intellectual Property Rights (IPR) – Discrimination-Moral Leadership –Code of Conduct – Corporate Social Responsibility.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

At the end of the course the students will be able to

CO1: Understand the need of value education.

CO2: Comprehend the difference between self and body.

CO3: Understand the need to exist as an unit of Family and society.

CO4: Understand Harmony at all levels.

CO5: Apply the values acquired in the professional front.

CO6: Identify appropriate technologies for ecofriendly production systems.

TEXT BOOKS:

1. Human Values and Professional Ethics by R R Gaur, R Sangal, G P Bagaria, Excel Books, New Delhi, 2010 3.
2. Mike W. Martin and Roland Schinzinger, ―Ethics in Engineering‖, Tata McGraw Hill, New Delhi, 2003.
3. Govindarajan M, Natarajan S, Senthil Kumar V. S, ―Engineering Ethics‖, Prentice Hall of India, New Delhi, 2004

REFERENCE BOOKS:

1. Jeevan Vidya: Ek Parichaya, A Nagaraj, Jeevan Vidya Prakashan, Amarkantak, 1999.
2. Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004.
3. The Story of Stuff (Book).
4. The Story of My Experiments with Truth - by Mohandas Karamchand Gandhi AICTE Model Curriculum in Humanities, Social Science and Management Courses (UG Engineering & Technology) 169 | Page .
5. Small is Beautiful - E. F Schumacher.
6. Slow is Beautiful - Cecile Andrews.
7. Economy of Permanence - J C Kumarappa 8. Bharat Mein Angreji Raj – Pandit Sunderlal.

8. Rediscovering India - by Dharampal.
9. Hind Swaraj or Indian Home Rule - by Mohandas K. Gandhi .
10. India Wins Freedom - Maulana Abdul Kalam Azad.
11. Vivekananda - Romain Rolland (English) 13. Gandhi - Romain Rolland (English).
12. Charles B. Fleddermann, ―Engineering Ethics‖, Pearson Prentice Hall, New Jersey, 2004.
13. Charles E. Harris, Michael S. Pritchard and Michael J. Rabins, ―Engineering Ethics – Concepts and Cases‖, Cengage Learning, 2009.

WEB SOURCES:

1. www.onlineethics.org
2. www.nspe.org
3. www.globalethics.org

COs	POs												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	-	-	-	-	-	3	3	3	3	3	-	-	-	-	3
2	-	-	-	-	-	3	3	3	3	3	-	-	-	-	3
3	-	-	-	-	-	3	3	3	3	3	-	-	-	-	3
4	-	-	-	-	-	3	3	3	3	3	-	-	-	-	3
5	-	-	-	-	-	3	3	3	3	3	-	-	-	-	3
6	-	-	-	-	-	3	3	3	3	3	-	-	-	-	3
Overall correlation	-	-	-	-	-	3	3	3	3	3	-	-	-	-	3

23ME311 MANUFACTURING PROCESSES

L	T	P	C
3	0	2	4

COURSE OBJECTIVES:

The learning objective of this course is

- To illustrate the working principles of various metal casting processes.
- To learn and apply the working principles of various metal joining processes.
- To analyze the working principles of bulk deformation of metals.
- To study the concepts and basic mechanics of metal cutting and the factors affecting machinability.
- To learn working of basic and advanced turning machines and super finishing process.

UNIT I METAL CASTING PROCESSES 9+6

Sand Casting: Sand Mould – Type of Patterns - Pattern Materials - Cores –Types and Applications –Melting Furnaces: Cupola Furnaces; Principle of Special Casting Processes: Shell - Investment – Pressure Die Casting - Centrifugal Casting – Stir Casting – CO_2 Casting; Defects in Sand Casting Process-Remedies.

UNIT II PRINCIPLES & APPLICATIONS OF JOINING PROCESSES 9+6

Operating Principle, Basic Equipment, Merits And Applications of: Fusion Welding Processes: Gas Welding - Manual Metal Arc Welding – Gas Tungsten Arc Welding - Gas Metal Arc Welding – Submerged Arc Welding; Operating Principle And Applications of: Resistance Welding - Plasma Arc Welding – Thermit Welding; Brazing And Soldering; Weld Defects.

UNIT III FORMING PROCESSES 9+6

Hot and Cold Working of metal – Forging processes- Open, impression and closed die forging - Rolling Mills – Rolling Operations - Principle of rod and wire drawing – Principles of Extrusion – Types – Hot and Cold extrusion. . Sheet metal operations – Blanking, Punching and Working principle and applications – Hydro forming – Metal spinning and Explosive forming,

UNIT IV MECHANICS OF METAL CUTTING 9+6

Mechanics of Chip Formation, Forces in Machining, Types of Chip, Cutting Tools – Single Point Cutting Tool Nomenclature, Orthogonal and Oblique Metal Cutting, Thermal Aspects, Cutting Tool Materials, Tool Wear, Tool Life, Surface Finish, Cutting Fluids.

UNIT V TURNING, GEAR CUTTING, SHAPING AND FINISHING PROCESSES 9+6

Centre Lathe, Constructional Features, Specification, Operations - Taper Turning Methods, Thread Cutting- Capstan and Turret Lathes. Gear cutting, Gear hobbing and Gear shaping. Types of grinding Process – Cylindrical grinding, surface grinding and internal grinding, Shaper and Milling machines and operations

LIST OF EXPERIMENTS

1. Preparing green sand moulds with cast patterns.
2. Taper Turning and Eccentric Turning on circular parts using lathe machine.

3. Knurling, external and internal thread cutting on circular parts using lathe machine.
4. Shaping – Square and Hexagonal Heads on circular parts using shaper machine.
5. Drilling using radial drilling machine.
6. Cutting spur and helical gear using milling machine.
7. Generating gears using gear hobbing machine.
8. Generating gears using gear shaping machine.
9. Grinding components using cylindrical grinding machine.
10. Grinding components using surface grinding machine

TOTAL: 45+30 PERIODS

COURSE OUTCOMES:

At the end of the course the students will be able to

CO1: Explain the principle of different metal casting processes.

CO2: Describe the various metal joining processes.

CO3: Summarize various bulk deformation processes and sheet metal forming processes.

CO4: Apply the mechanism of metal removal process and to identify the factors involved in Improving machinability.

CO5: Explain the constructional and operational features of Centre lathe and other special purpose Lathes.

CO6: Describe the constructional features of gear cutting and super finishing process.

TEXT BOOKS:

1. Kalpakjian, S., "Manufacturing Engineering and Technology", Pearson education India, 4th Edition, 2009.
2. P.N.Rao Manufacturing Technology Volume 1 Mc Grawhill Education 5th edition, 2018.

REFERENCE BOOKS:

1. Rao. P.N "Manufacturing Technology," Metal Cutting and Machine Tools, Tata McGraw- Hill, New Delhi, 2009.
2. Hajra Chouldhary S.K and Hajra Choudhury. AK., Elements of workshop Technology, volume I and II, Media promoters and Publishers Private Limited, Mumbai, 1997
3. Sharma, P.C., A Text book of production Technology, S.Chand and Co. Ltd., 2004

COs	POs												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	3	3	2	2	-	-	-	-	-	-	1	1	3	2	2
2	3	3	2	2	-	-	-	-	-	-	1	1	3	2	2
3	3	3	2	2	-	-	-	-	-	-	1	1	3	2	2
4	3	3	2	2	-	-	-	-	-	-	1	1	3	2	2
5	3	3	2	2	-	-	-	-	-	-	1	1	3	2	2
6	3	3	2	2	-	-	-	-	-	-	1	1	3	2	2
Overall correlation	3	3	2	2	-	-	-	-	-	-	1	1	3	2	2

23ME312	**FLUID MECHANICS AND HYDRAULIC MACHINERY**	**L**	**T**	**P**	**C**
		3	**0**	**2**	**4**

COURSE OBJECTIVES:

- Study about the properties of the fluids and behavior of fluids under static conditions.
- Gain basic knowledge of the dynamics of fluids and boundary layer concepts.
- Study the applications of the conservation laws to flow measurements, flow through pipes and forces on pipe bends.
- Learn the significance of boundary layer theory and its thicknesses.
- Study the basic principles of working and design of Pelton wheel, Francis and Kaplan turbine.
- Acquire knowledge on working principles of centrifugal, reciprocating and rotary pumps.

UNIT I FLUID PROPERTIES AND FLOW CHARACTERISTICS 9+6

Fluid Definition and Classification – Properties of fluids, Fluid statics - Pressure Measurements - Buoyancy and floatation - forces on submerged bodies, stability of floating bodies, Flow characteristics - Concept of control volume and system – Velocity potential and stream functions, Continuity equation, energy equation and momentum equation - Applications.

UNIT II FLOW THROUGH PIPES AND BOUNDARY LAYER 9+6

Reynold's Experiment - Laminar flow through circular conduits - Darcy Weisbach equation - friction factor - Moody diagram - Major and minor losses - Hydraulic and energy gradient lines - Pipes in series and parallel - Boundary layer concepts - Types of boundary layer thickness.

UNIT III DIMENSIONAL ANALYSIS AND MODEL STUDIES 9+6

Fundamental dimensions - Dimensional homogeneity - Rayleigh's method and Buckingham Pi theorem - Dimensionless parameters - Similitude and model studies - Distorted and undistorted models.

UNIT IV TURBINES 9+6

Impact of jets - Velocity triangles - Theory of rotodynamic machines - Classification of turbines - Working principles - Pelton wheel - Modern Francis turbine - Kaplan turbine - Work done - Efficiencies - Draft tube - Specific speed - Performance curves for turbines - Governing of turbines.

UNIT V PUMPS 9+6

Classification of pumps - Centrifugal pumps - Working principle - Heads and efficiencies– Velocity triangles - Work done by the impeller - Performance curves - Reciprocating pump working principle - Indicator diagram and it's variations - Work saved by fitting air vessels - Rotary pumps.

LIST OF EXPERIMENTS

1. Determination of coefficient of discharge of a venturimeter.
2. Determination of coefficient of discharge of an orificemeter.
3. Determination of friction factor for flow through pipes.
4. Determination of metacentric height.
5. Characteristics of centrifugal pumps.
6. Characteristics of reciprocating pump.
7. Characteristics of gear pump.
8. Characteristics of Pelton wheel turbine.
9. Flow measurement using Rotameter
10. Characteristics of Francis turbine.

TOTAL: 45 + 30 PERIODS

COURSE OUTCOMES:

At the end of the course the students will be able to

CO1: Apply the conservation laws applicable to fluids and its application through fluid kinematics and dynamics and also to understand the properties and behavior of fluids in static conditions.

CO2: Estimate the losses in pipelines for both laminar and turbulent conditions and analysis of pipes connected in series and parallel.

CO3: Apply the concept of boundary layer and its thickness on the flat solid surface.

CO4: Formulate the relationship among the parameters involved in the given fluid phenomenon and to predict the performances of prototype by model studies.

CO5: Design the various types of turbines and to explain its working principles.

CO6: Design the various types of pumps and to explain its working principles.

TEXT BOOKS:

1. Modi P.N. and Seth, S.M. Hydraulics and Fluid Mechanics, Standard Book House, New Delhi, 22nd edition (2019)
2. R K Bansal, A Text Book of Fluid Mechanics and Hydraulic Machines, Laxmi Publications, New Delhi.
3. Kumar K. L., Engineering Fluid Mechanics, Eurasia Publishing House (p) Ltd. New Delhi, 2016.

REFERENCE BOOKS:

1. Streeter, V. L. and Wylie E. B., Fluid Mechanics, McGraw Hill Publishing Co., 2010.
2. Cengel Y A and Cimbala J M, Fluid Mechanics, McGraw Hill Education Pvt. Ltd., 2014.
3. S K Som; Gautam Biswas and S Chakraborty, Introduction to Fluid Mechanics and Fluid Machines, Tata McGraw Hill Education Pvt. Ltd., 2012.

COs	POs												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	3	3	2	2	1	2	2	1	2	1	1	1	3	2	2
2	3	3	2	2	1	2	2	1	2	1	1	1	3	2	2
3	3	3	2	2	1	2	2	1	2	1	1	1	3	2	2
4	3	3	2	2	1	2	2	1	2	1	1	1	3	2	2
5	3	3	2	2	1	2	2	1	2	1	1	1	3	2	2
6	3	3	2	2	1	2	2	1	2	1	1	1	3	2	2
Overall correlation	3	3	2	2	1	2	2	1	2	1	1	1	3	2	2

23ME321 COMPUTER AIDED MACHINE DRAWING LABORATORY

	L	T	P	C
23ME321 COMPUTER AIDED MACHINE DRAWING LABORATORY	**0**	**0**	**4**	**2**

COURSE OBJECTIVES:

- Make students understand and interpret drawings of machine components.
- Prepare assembly drawings both manually and using standard CAD packages.
- Familiarize the students with Indian Standards on drawing practices and standard components.
- Gain practical experience in handling 2D drafting and 3D modeling software systems.

UNIT I DRAWING STANDARDS, FITS AND TOLERANCES 15

Code of practice for Engineering Drawing, BIS specifications – Welding symbols, riveted joints, keys, fasteners – Reference to hand book for the selection of standard components like bolts, nuts, screws, keys etc. - Limits, Fits – Tolerancing of individual dimensions – Specification of Fits – Preparation of production drawings and reading of part and assembly drawings, basic principles of geometric dimensioning & tolerancing.

UNIT II INTRODUCTION TO 2D DRAFTING 15

Drawing, Editing, Dimensioning, Layering, Hatching, Block, Array, Detailing, Detailed drawing. - Bearings - Bush bearing, Plummer block -Valves - Safety and non-return valves.

UNIT III 3D GEOMETRIC MODELING AND ASSEMBLY 30

Sketcher - Datum planes – Protrusion – Holes - Part modeling – Extrusion – Revolve – Sweep – Loft – Blend – Fillet - Pattern – Chamfer - Round - Mirror – Section - Assembly • Couplings – Flange, Universal, Oldham's, Muff, Gear couplings • Joints – Knuckle, Gib & cotter, strap, sleeve & cotter joints • Engine parts – Piston, connecting rod, cross-head (vertical and horizontal), stuffing box, multi-plate clutch • Miscellaneous machine components – Screw jack, machine vice, tail stock, chuck, vane and gear pump.

TOTAL: 60 PERIODS

Note: 25% of assembly drawings must be done manually and remaining 75% of assembly drawings must be done by using any CAD software. The above tasks can be performed manually and using standard commercial 2D / 3D CAD software.

COURSE OUTCOMES:

At the end of the course, students will be able to

CO1: Follow the drawing standards, Fits and Tolerances.
CO2: Re-create part drawings, sectional views and assembly drawings as per standards.
CO3: Prepare standard drawing layout for modelled parts.
CO4: Model orthogonal views of machine components.
CO5: Prepare standard drawing layout for modelled assemblies with BoM.
CO6: Interpret the importance of GD&T.

TEXT BOOKS:

1. Gopalakrishna K.R., "Machine Drawing", 22nd Edition, Subhas Stores Books Corner, Bangalore, 2013.
2. N. D. Bhatt and V.M. Panchal, "Machine Drawing", 48th Edition, Charotar Publishers, 2013.
3. Junnarkar, N.D., "Machine Drawing", 1st Edition, Pearson Education, 2004.
4. N. Siddeshwar, P. Kanniah, V.V.S. Sastri, "Machine Drawing", published by Tata Mc Graw Hill, 2006.
5. S. Trymbaka Murthy, "A Text Book of Computer Aided Machine Drawing", CBS Publishers, New Delhi, 2007.

COs	POs												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	3	3	2	2	1	2	-	-	2	-	-	-	3	2	-
2	3	3	2	2	1	2	-	-	2	-	-	-	3	2	-
3	3	3	2	2	1	2	-	-	2	-	-	-	3	2	-
4	3	3	2	2	1	2	-	-	2	-	-	-	3	2	-
5	3	3	2	2	1	2	-	-	2	-	-	-	3	2	-
6	3	3	2	2	1	2	-	-	2	-	-	-	3	2	-
Overall correlation	3	3	2	2	1	2	-	-	2	-	-	-	3	2	-

23ES391 PRESENTATION SKILLS

L	T	P	C
0	0	2	1*

COURSE OBJECTIVES:

- To help learners use brainstorming techniques for generating, organizing and outlining ideas.
- To familiarize learners with different speech structures by engaging them in watching speeches with great opening and closing.
- To give practice on voice modulation and use of body language and eye contact for making captivating presentations.
- To give hands on training on preparing presentation slides and using remote presentation tools.
- To train students on responding to question and feedback with confidence.

UNIT I BRAINSTORMING AND OUTLINING 6

Mind Mapping based on prior knowledge, collecting additional information from external resources, giving prompts to Generative AI tools seeking information, organizing ideas generated, knowing your audience.

UNIT II STRUCTURING THE PRESENTATION 6

3 Ts of a presentation, writing effective introduction- Beginning the introduction with a hook (question, data, storytelling) and closing the introduction with the objective of the presentation. Structuring the body paragraphs -Choosing key ideas from the list of ideas generated during brainstorming. Substantiating ideas with examples, data, reasons and anecdotes. Summarizing the ideas for conclusion.

UNIT III DELIVERY TECHNIQUES 6

Vocal variety, intonation, reducing filler words and improving articulation, inflection, engaging the audience. Body language- eye contact, gestures, movement on stage.

UNIT IV USE OF TECHNOLOGICAL AIDS 6

Use of presentation software like MS Power Point, Google Slides etc, incorporating images, graphs, charts and videos, using interactive tools like quizzes and polls, using remote presentation tools like zoom, MS Teams, WebEx for screen sharing, virtual whiteboards and chat functionalities, incorporating AR/VR for more immersive presentations.

UNIT V HANDLING QUESTIONS AND FEEDBACK 6

Audience engagement through questions, PAR (Point, Answer, Redirect) strategy for structuring responses to questions. Understanding feedback process - Receiving, interpreting and evaluating constructively, active listening techniques for processing feedback, responding to feedback- acknowledging, clarifying and appreciating, Dealing with challenging feedback.

TOTAL: 30 PERIODS

COURSE OUTCOMES:

After completion of the course, the students should be able to

CO1: construct ideas for presentation through mind mapping techniques.

CO2: organize ideas and structure the presentation with captivating introduction, body paragraphs illustrated with examples and reasons and compelling conclusion.

CO3: apply vocal variety and body language techniques to enhance delivery.

CO4: prepare engaging presentations by integrating multimedia elements.

CO5: demonstrate proficiency in delivering presentations in remote platforms utilizing various technological tools and strategies to engage audience in virtual environments.

CO6: exhibit active listening skills by responding to questions with clarity and confidence and incorporating constructive feedback for professional development.

TEXT BOOKS:

1. "Slide:ology: The Art and Science of Creating Great Presentations" by Nancy Duarte. O'Reilly Media.
2. "The Naked Presenter: Delivering Powerful Presentations With or Without Slides" by Garr Reynolds. New Riders.

REFERENCE BOOK:

Talk Like TED: The 9 Public-Speaking Secrets of the World's Top Minds" by Carmine Gallo.

COs	POs												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	-	-	-	-	-	1	1	-	2	3	-	2	-	-	-
2	-	-	-	-	-	1	1	-	2	3	-	2	-	-	-
3	-	-	-	-	-	-	-	-	2	3	-	2	-	-	-
4	-	-	-	-	3	-	-	-	-	3	-	2	-	-	-
5	-	-	-	-	3	-	-	-	3	3	-	2	-	-	-
6	-	-	-	-	-	-	-	-	-	3	-	-	-	-	-
Overall correlation	-	-	-	-	3	1	1		3	3	-	2	-	-	-

23MA401 OPTIMIZATION TECHNIQUES

L	T	P	C
3	1	0	4

COURSE OBJECTIVES:

- Formulate and solve linear programming problems (LPP).
- Evaluate Transportation and Assignment Problems.
- Obtain solution to network problems using CPM and PERT techniques.
- Optimize the function subject to the constraints.

UNIT I LINEAR PROGRAMMING MODELS 9+3

Introduction of Operations Research - mathematical formulation of LPP-Graphical Methods to solve LPP- Simplex Method- Big M method, Two phase method.

UNIT II TRANSPORTATION PROBLEMS AND ASSIGNMENT PROBLEMS 9+3

Transportation problem (TP) - finding basic feasible solution of TP using North-West Corner Rule, Least Cost and Vogel's Approximation Method - MODI method for finding optimal solution for TP - Assignment problem - Hungarian method for solving Assignment problem - Travelling salesman problem as assignment problem – Production Scheduling problem – Introduction, Problems in single machine scheduling.

UNIT III INVENTORY CONTROL 9+3

Introduction, Models – Problems in Purchase and Production (Manufacturing) models with and without shortages – Theory on types of inventory control systems: P& Q, ABC, VED, FNS, XYZ, SDE and HML.

UNIT IV PROJECT MANAGEMENT 9+3

Project definition - Gantt chart - Project network - Diagram representation – Floats - Critical path method (CPM) – PERT- Cost considerations in PERT and CPM.

UNIT V CLASSICAL OPTIMIZATION THEORY 9+3

Unconstrained problems – necessary and sufficient conditions - Newton-Raphson method, Constrained problems – equality constraints – inequality constraints - Kuhn-Tucker conditions.

TOTAL: 60 PERIODS

COURSE OUTCOMES:

At the end of the course the students will be able to

CO 1 Formulate and solve linear programming problems (LPP).

CO 2 Examine Transportation Problems.

CO 3 Examine Assignment Problems.

CO 4 Plan the purchase/ manufacturing policies to meet customer demands.

CO 5 Obtain solution to network problems using CPM and PERT Techniques.

CO 6 Optimize the function subject to the constraints.

TEXT BOOKS:

1. Hamdy A Taha, Operations Research: An Introduction, Pearson, 10th Edition, 2017.
2. R. Pannerselvan, Operations Research, 2nd Edition, PHI Publications, 2006.

REFERENCE BOOKS:

1. Dontzig G.B, Linear Programming and extensions, Princeton University Press.
2. ND Vohra, Quantitative Techniques in Management, Tata McGraw Hill, 4th Edition, 2011.
3. J. K. Sharma, Operations Research Theory and Applications, Macmillan, 5th Edition, 2012.

COs	**POs**												**PSOs**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
1	3	3	2	1	-	-	-	-	-	-	1	2	1	-	-
2	3	3	2	1	-	-	-	-	-	-	1	2	1	-	-
3	3	3	2	1	-	-	-	-	-	-	1	2	1	-	-
4	3	3	2	1	-	-	-	-	-	-	1	2	1	-	-
5	3	3	2	1	-	-	-	-	-	-	1	2	1	-	-
6	3	3	2	1	-	-	-	-	-	-	1	2	1	-	-
Overall correlation	3	3	2	1	-	-	-	-	-	-	1	2	1		

23ME401 THERMAL ENGINEERING

L	T	P	C
3	0	0	3

COURSE OBJECTIVES:

- To learn the concepts and laws of thermodynamics to predict the operation of thermodynamic cycles and performance of Internal Combustion(IC) engines and Gas Turbines.
- To analyze the performance of steam nozzle, calculate critical pressure ratio.
- To Evaluate the performance of steam turbines through velocity triangles, understand the need for governing and compounding of turbines.
- To analyze the working of IC engines and various auxiliary systems present in IC engines.
- To evaluate the various performance parameters of IC engines.

UNIT I THERMODYNAMIC CYCLES 9

Air Standard Cycles – Carnot, Otto, Diesel, Dual, Brayton – Cycle Analysis, Performance and Comparison, Basic Rankine Cycle, modified, reheat and regenerative cycles.

UNIT II STEAM NOZZLES AND INJECTOR 9

Types and Shapes of nozzles, Flow of steam through nozzles, Critical pressure ratio, Variation of mass flow rate with pressure ratio. Effect of friction. Metastable flow.

UNIT III STEAM AND GAS TURBINES 9

Types, Impulse and reaction principles, Velocity diagrams, Work done and efficiency – optimal operating conditions. Multi-staging, compounding and governing. Gas turbine cycle analysis – open and closed cycle. Performance and its improvement - Regenerative, Intercooled, Reheated cycles and their combination.

UNIT IV INTERNAL COMBUSTION ENGINES – FEATURES AND COMBUSTION 9

IC engine – Classification, working, components and their functions. Ideal and actual : Valve and port timing diagrams, p-v diagrams- two stroke & four stroke, and SI & CI engines – comparison. Geometric, operating, and performance comparison of SI and CI engines. Desirable properties and qualities of fuels. Air-fuel ratio calculation – lean and rich mixtures. Combustion in SI & CI Engines – Knocking – phenomena and control.

UNIT V INTERNAL COMBUSTION ENGINE PERFORMANCE AND AUXILIARY SYSTEMS 9

Performance and Emission Testing, Performance parameters and calculations. Morse and Heat Balance tests. Multipoint Fuel Injection system and Common rail direct injection systems. Ignition systems – Magneto, Battery and Electronic. Lubrication and Cooling systems. Concepts of Supercharging and Turbocharging – Emission Norms.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

At the end of the course the students will be able to

CO1: learn the concepts and laws of thermodynamics to predict the operation of thermodynamic cycles and performance of Internal Combustion(IC) engines and Gas Turbines.

CO2: analyze the performance of steam nozzle, calculate critical pressure ratio.

CO3: evaluate the performance of steam turbines through velocity triangles, understand the need for governing and compounding of turbines.

CO4: analyze the working of IC engines and various auxiliary systems present in IC engines.

CO5: evaluate the various performance parameters of IC engines.

CO6: understand the performance of thermodynamic cycles, steam nozzles, steam turbines, gas turbines and IC engines.

TEXT BOOKS:

1. Mahesh. M. Rathore, “Thermal Engineering”, 1st Edition, Tata McGraw Hill, 2010.
2. Ganesan.V, " Internal Combustion Engines" 4th Edition, Tata McGraw Hill, 2012.

REFERENCE BOOKS:

1. Ballaney. P, “Thermal Engineering”, 25th Edition, Khanna Publishers, 2017.
2. Domkundwar, Kothandaraman, &Domkundwar, “A Course in Thermal Engineering”, 6th Edition, DhanpatRai& Sons, 2011.
3. Gupta H.N, “Fundamentals of Internal Combustion Engines”, 2nd Edition Prentice Hall of India, 2013.
4. Mathur M.L and Mehta F.S., “Thermal Science and Engineering”, 3rd Edition, Jain Brothers Pvt. Ltd,2017.
5. Soman. K, “Thermal Engineering”, 2nd Edition, Prentice Hall of India, 2011.

COs	**POs**												**PSOs**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
1	3	3	2	1	-	-	-	-	-	-	-	2		-	-
2	3	3	2	1	-	-	-	-	-	-	-	2		-	-
3	3	3	2	1	-	-	-	-	1	-	1	2	3	-	3
4	3	3	2	1	-	1	-	-	2	-	1	2	3	2	-
5	3	3	2	1	-	1	-	-	2	-	1	2	3	2	3
6	3	3	2	1	-	1	-	-	2	-	1	2	3	2	3
Overall correlation	3	3	3	1	-	1	-	-	2	-	1	2	3	2	3

23ME402 THEORY OF MACHINES

	L	T	P	C
	3	1	0	3

COURSE OBJECTIVES:

- Study the basic components of mechanisms, analyzing the assembly with respect to the displacement, velocity, and acceleration at any point in a link of a mechanism and design cam mechanisms for specified output motions.
- Study the basic concepts of toothed gearing and kinematics of gear trains.
- Analyze the effects of friction in machine elements.
- Analyze the force-motion relationship in components subjected to external forces and analyzing of standard mechanisms.
- Analyze the undesirable effects of unbalances resulting from prescribed motions in mechanism and the effect of dynamics of undesirable vibrations.

UNIT I KINEMATICS OF MECHANISMS 9+3

Mechanisms – Terminology and definitions – kinematics inversions of 4 bar and slide crank chain – kinematics analysis in simple mechanisms , Mechanisms with lower pairs-Straight line mechanism, steering gear mechanisms– velocity and acceleration polygons – cams – classifications – displacement diagrams - layout of plate cam profiles – derivatives of followers motion.

UNIT II GEARS AND GEAR TRAINS 9+3

Spur gear – law of toothed gearing – involute gearing – Interchangeable gears – Gear tooth action interference and undercutting – nonstandard teeth – gear trains – parallel axis gears trains – epicyclic gear trains – automotive transmission gear trains.

UNIT III FRICTION IN MACHINE ELEMENTS 9+3

Surface contacts – Sliding and Rolling friction – Friction drives – Friction in screw threads – Bearings and lubrication – Friction clutches – Belt and rope drives – Friction aspects in brakes– Friction in vehicle propulsion and braking.

UNIT IV FORCE ANALYSIS 9+3

Dynamic force analysis – Inertia force and Inertia torque– D Alembert's principle – Dynamic Analysis in reciprocating engines – Gas forces – Inertia effect of connecting rod– Bearing loads – Crank shaft torque – Turning moment diagrams –Fly Wheels – Flywheels of punching presses- Dynamics of Cam- follower mechanism.

UNIT V BALANCING AND VIBRATION 9+3

Balancing of revolving and reciprocating masses – Balancing machines – free vibrations – Equations of motion – natural Frequency – Damped Vibration – bending critical speed of simple shaft – Torsional vibration – Forced vibration – harmonic Forcing – Vibration isolation. Gyroscopic forces and torques – Gyroscopic stabilization – Gyroscopic effects in Automobiles, ships and airplanes.

TOTAL: 60 PERIODS

COURSE OUTCOMES:

At the end of the course the students will be able to

CO1: Discuss the basics of mechanisms.
CO2: Solve problems on gears and gear trains.
CO3: Examine friction in machine elements.
CO4: Calculate the static and dynamic forces of mechanisms.
CO5: Calculate the balancing masses and their locations of reciprocating and rotating masses.
CO6: Compute the frequency of free vibration, forced vibration and damping coefficient.

TEXT BOOKS:

1. Uicker, J.J., Pennock G.R and Shigley, J.E., "Theory of Machines and Mechanisms", Oxford University Press, 2017.
2. Ramamurthi. V, "Mechanics of Machines", Narosa Publishing House, 3rd edition 2019.

REFERENCE BOOKS:

1. AmitabhaGhosh and Asok Kumar Mallik, "Theory of Mechanisms and Machines", Affiliated East-West Pvt. Ltd., 1988.
2. Rao.J.S. and Dukkipati.R.V. "Mechanism and Machine Theory", New Age International Pvt. Ltd., 2nd edition, 2014.
3. Rattan, S.S, "Theory of Machines", McGraw-Hill Education Pvt. Ltd., 5th edition, 2019.
4. Robert L. Norton, Kinematics and Dynamics of Machinery, Tata McGraw-Hill, 2013.
5. Wilson and Sadler, Kinematics and Dynamics of Machinery, Pearson, 2008.

COs	**POs**												**PSOs**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
1	3	2	2	-	2	-	-	2	-	-	-	1	3	-	1
2	3	2	2	-	2	-	-	2	-	-	-	1	3	-	1
3	3	2	2	-	2	-	-	2	-	-	-	1	3	-	1
4	3	2	2	-	2	-	-	2	-	-	-	1	3	-	1
5	3	2	2	-	2	-	-	2	-	-	-	1	3	-	1
6	3	2	2	-	2	-	-	2	-	-	-	1	3	-	1
Overall correlation	3	2	2	-	2	-	-	2	-	-	-	1	3	-	1

23CE412 STRENGTH OF MATERIALS

L	T	P	C
3	0	2	4

COURSE OBJECTIVES:

- To understand the concepts of stress, strain, principal stresses and principal planes.
- To study the concept of shearing force and bending moment due to external loads in determinate beams and their effect on stresses.
- To determine stresses and deformation in circular shafts and helical spring due to torsion.
- To compute slopes and deflections in determinate beams by various methods.
- To study the stresses and deformations induced in thin and thick shells.

UNIT I STRESS, STRAIN AND DEFORMATION OF SOLIDS 9+6

Rigid bodies and deformable solids – Tension, Compression and Shear Stresses – Deformation of simple and compound bars – Thermal stresses – Elastic constants, Poisson's ratio – Volumetric strains – Stresses on inclined planes – principal stresses and principal planes – Mohr's circle for plane stress.

UNIT II TRANSVERSE LOADING ON BEAMS AND STRESSES IN BEAMS 9+6

Beams – types transverse loading on beams – Shear force and bending moment in beams – Cantilevers – Simply supported beams and over – hanging beams. Theory of simple bending– bending stress distribution – Load carrying capacity – Proportioning of sections– Shear stress distribution.

UNIT III DEFLECTION OF BEAMS 9+6

Double Integration method – Macaulay's method – Area moment method- Conjugate beam method for computation of slopes and deflections in determinate beams.

UNIT IV TORSION, SPRINGS AND COLUMNS 9+6

Theory of Torsion - Stresses and deformations in solid and hollow circular shafts – Stepped shafts – Power transmitted by a shaft.

Helical springs – Differences between closely coiled and open coiled helical springs – Closely coiled helical springs – Calculation of shear stress, deflection and stiffness.

Columns – Euler's theory – Calculation of crippling load for different end conditions for a long column.

UNIT V THIN CYLINDERS, SPHERES AND THICK CYLINDERS 9+6

Stresses in thin and thick cylindrical shell, deformation in thin and thick cylinders – spherical shells subjected to internal pressure –Deformation in spherical shells.

LIST OF EXPERIMENTS

1. Tension test on mild steel rod
2. Double shear test on mild steel rod
3. Torsion test on mild steel rod
4. Izod Impact test on metal specimen
5. Charpy Impact test on metal specimen
6. Rockwell Hardness test on metals
7. Brinell Hardness test on metals
8. Compression test on helical spring.
9. Heat Treatment Processes- Annealing, Normalizing, Quenching and Tempering
10. Jominy End Quench Test

TOTAL: 45 + 30 PERIODS

COURSE OUTCOMES:

At the end of the course the students will be able to

CO1: Calculate the different stresses developed in the solids when subjected to different loading conditions.

CO2: Interpret the shear force and bending moment diagrams of the beams under the various loading conditions

CO3: Examine the bending stress and shear stress distribution of various sections of the beam.

CO4: Calculate the slope and deflection of beams using different methods.

CO5: Apply the basic equations to design shafts, springs and columns.

CO6: Calculate the stresses developed in the thin cylinder, thick cylinder, and spherical shells.

TEXT BOOKS:

1. Bansal, R.K., "Strength of Materials", Laxmi Publications (P) Ltd., 2016
2. Rattan S.S., “Strength of Materials", Tata McGraw Hill Education Pvt. Ltd., New Delhi, 2017.

REFERENCE BOOKS:

1. Rajput R.K. “Strength of Materials (Mechanics of Solids)", S.Chand & company Ltd., New Delhi, 7th edition, 2018.
2. Egor P Popov, “Engineering Mechanics of Solids”, 2nd edition, PHI Learning Pvt. Ltd., New Delhi, 2015.
3. Beer. F.P. & Johnston. E.R. “Mechanics of Materials”, Tata McGraw Hill, 8th Edition, New Delhi 2019.
4. Subramanian R., "Strength of Materials", Oxford University Press, Oxford Higher Education Series, 2010.

COs	POs												PSOs		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
1	3	2	1	1	1	1	-	-	2	-	-	-	3	1	-
2	3	2	1	1	1	1	-	-	2	-	-	-	3	1	-
3	3	2	1	1	1	1	-	-	2	-	-	-	3	1	-
4	3	2	1	1	1	1	-	-	2	-	-	-	3	1	-
5	3	2	1	1	1	1	-	-	2	-	-	-	3	1	-
6	3	2	1	1	1	1	-	-	2	-	-	-	3	1	-
Overall correlation	3	2	1	1	1	1	-	-	2	-	-	-	3	1	-

23ME421 THERMAL ENGINEERING LABORATORY **L T P C**
0 0 4 2

COURSE OBJECTIVES:

- Study the valve and port timing diagram of IC engines.
- Conduct the performance test of IC engines.
- Conduct the performance test on reciprocating air compressor.
- Study the performance of steam generator and steam turbine.

LIST OF EXPERIMENTS :

1. Valve Timing and Port Timing diagrams.
2. Actual p-v diagrams of IC engines.
3. Determination of Flash Point and Fire Point of various fuels / lubricants.
4. Performance Test on four – stroke Diesel Engine.
5. Heat Balance Test on 4 – stroke Diesel Engine.
6. Morse Test on Multi-Cylinder Petrol Engine.
7. Retardation Test on a Diesel Engine.
8. Determination of p-θ diagram and heat release characteristics of an IC engine.
9. Performance test on a two stage Reciprocating Air compressor.
10. Study of Steam generators.
11. Study of Steam turbines.

TOTAL : 60 PERIODS

COURSE OUTCOMES:

At the end of the course the students will be able to

CO1: conduct tests to evaluate performance characteristics of IC engines.
CO2: conduct test the Performance and Energy Balance on a Steam generator.
CO3: conduct test the Performance and Energy Balance on a Steam turbine.
CO4: conduct tests to evaluate performance characteristics of reciprocating air compressor.
CO5: study the valve and port timing diagram of engines.
CO6: Study the performance characteristics of Air compressor.

COs	POs												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	3	2	1	1	1	1	-	-	2	-	-	-	3	1	-
2	3	2	1	1	1	1	-	-	2	-	-	-	3	1	-
3	3	2	1	1	1	1	-	-	2	-	-	-	3	1	-
4	3	2	1	1	1	1	-	-	2	-	-	-	3	1	-
5	3	2	1	1	1	1	-	-	2	-	-	-	3	1	-
6	3	2	1	1	1	1	-	-	2	-	-	-	3	1	-
Overall correlation	3	2	1	1	1	1	-	-	2	-	-	-	3	1	-

23ME422 KINEMATICS AND DYNAMICS LABORATORY

	L	T	P	C
	0	**0**	**4**	**2**

COURSE OBJECTIVES:

- Supplement the principles learnt in kinematics and Dynamics of Machinery..
- Demonstrate how certain measuring devices are used for dynamic testing.

LIST OF EXPERIMENTS :

1. a) Study of gear parameters. b) Experimental study of velocity ratios of simple, compound, Epicyclic and differential gear trains.
2. a) Kinematics of Four Bar, Slider Crank, Crank Rocker, Double crank, Double rocker, Oscillating cylinder Mechanisms. b) Kinematics of single and double universal joints.
3. a) Determination of Mass moment of inertia of Fly wheel and Axle system. b) Determination of Mass Moment of Inertia of axisymmetric bodies using Turn Table apparatus. c) Determination of Mass Moment of Inertia using bifilar suspension and compound pendulum.
4. Motorized gyroscope – Study of gyroscopic effect and couple.
5. Governor - Determination of range sensitivity, effort etc., for Watts, Porter, Proell, and Hartnell Governors.
6. Cams – Cam profile drawing, Motion curves and study of jump phenomenon
7. a) Single degree of freedom Spring Mass System – Determination of natural Frequency and verification of Laws of springs – Damping coefficient determination. b) Multi degree freedom suspension system – Determination of influence coefficient.
8. a) Determination of torsional natural frequency of single and Double Rotor systems.- Undamped and Damped Natural frequencies. b) Vibration Absorber – Tuned vibration absorber.
9. Vibration of Equivalent Spring mass system – undamped and damped vibration.
10. Whirling of shafts – Determination of critical speeds of shafts with concentrated loads.
11. a) Balancing of rotating masses. (b) Balancing of reciprocating masses.
12. a) Transverse vibration of Free-Free beam – with and without concentrated masses. b) Forced Vibration of Cantilever beam – Mode shapes and natural frequencies. c) Determination of transmissibility ratio using vibrating table.

TOTAL : 60 PERIODS

COURSE OUTCOMES:

At the end of the course the students will be able to

CO1: Apply the principles of kinematics by doing experiments in epicyclic gear trains and slider crank mechanism..

CO2: Apply the principles to determine mass moment of inertia by flywheel and axle system, turn table apparatus and bifilar suspension.

CO3: Analyse the effects of controlling mechanism by doing experiments on Universal Governor apparatus and gyroscope.

CO4: Analyse the vibration principles to determine the natural frequency of Undamped and damped vibration of longitudinal system and evaluate the critical speed of the transverse system.

CO5: Apply the concepts of single and two rotor systems for the natural frequency of torsional vibrations.

CO6: Make use of measuring devices for dynamic testing.

COs	POs												PSOs		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
1	3	2	1	1	1	1	-	-	2	-	-	3	1	-	-
2	3	2	1	1	1	1	-	-	2	-	-	3	1	-	-
3	3	2	1	1	1	1	-	-	2	-	-	3	1	-	-
4	3	2	1	1	1	1	-	-	2	-	-	3	1	-	-
5	3	2	1	1	1	1	-	-	2	-	-	3	1	-	-
6	3	2	1	1	1	1	-	-	2	-	-	3	1	-	-
Overall correlation	3	2	1	1	1	1	-	-	2	-	-	3	1	-	-

23ES491 APTITUDE AND LOGICAL REASONING –I

	L	T	P	C
	0	0	2	1

COURSE OBJECTIVES:

- To improve the problem solving and logical thinking ability of the students.
- To acquaint student with frequently asked questions and patterns in quantitative aptitude and logical reasoning.

UNIT I **4**

Numbers, LCM, HCF, Averages, Ratio & Proportion, Mixtures & Allegation.

UNIT II **4**

Percentages, Time and work, Pipes and Cistern, coding and decoding.

UNIT III **4**

Time Speed Distance, Train, Boats and Streams, Analogy.

UNIT IV **4**

Data Interpretation(BAR,PIE,LINE), Seating arrangement.

UNIT V **4**

Simple Interest and Compound Interest, Profit loss and Discount, Partnership.

TOTAL: 20 PERIODS

COURSE OUTCOMES:

At the end of the course the students will be able to

CO 1 Understand the basic concepts of quantitative ability.

CO 2 Understand the basic concepts of logical reasoning Skills.

CO 3 Increase in critical thinking skills.

CO 4 Able to solve campus placements aptitude papers covering Quantitative Ability, Logical Reasoning Ability.

TEXT BOOK:

APTIPEDIA, 2nd edition, Wiley Publishers.

REFERENCE BOOKS:

1. Quantitative Aptitude – R.S. Agarwal.
2. A Modern Approach To Verbal & Non-Verbal Reasoning By R S Agarwal.

KCG COLLEGE OF TECHNOLOGY
(AUTONOMOUS)
REGULATIONS 2023
B.E. MECHATRONICS ENGINEERING
CHOICE BASED CREDIT SYSTEM
CURRICULA FOR SEMESTERS I TO VIII

SEMESTER – I

SL. NO.	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
	23IP101	Induction Programme		-	-	-	-	-
THEORY								
1	23HS101	Essential Communication	HSMC	3	0	0	3	3
2	23MA101	Matrices and Calculus	BSC	3	0	0	3	3
3	23AD101	Programming in Python	ESC	3	0	0	3	3
4	23HS102	Heritage of Tamils	HSMC	1	0	0	1	1
THEORY AND PRACTICALS								
5	23PH111	Engineering Physics	BSC	3	0	2	5	4
6	23CY111	Engineering Chemistry	BSC	3	0	2	5	4
PRACTICALS								
7	23AD121	Python Programming Laboratory	ESC	0	0	4	4	2
8	23HS121	Communication Skills Laboratory	EEC	0	0	2	2	1
9	23HS122	General Clubs/Technical Clubs/NCC/NSS/Extension	HSMC	0	0	2	2	1*
TOTAL				**16**	**0**	**12**	**28**	**21**

SEMESTER – II

SL. NO.	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	**T**	**P**		
THEORY								
1	23HS201 /23HS202	Professional English / Foreign Language	HSMC	3	0	0	3	3
2	23MA203	Statistics and Numerical Methods	BSC	3	1	0	4	4
3	23PH202	Applied Material Science	BSC	3	0	0	3	3
4	23ME201	Applied Mechanics	PCC	3	0		3	3
5	23HS203	Tamils and Technology	HSMC	1	0	0	1	1
THEORY AND PRACTICALS								
6	23ME211	Engineering Graphics	ESC	3	0	2	5	4
7	23EE283	Basic Electrical, Electronics Engineering and Measurements	ESC	2	0	2	4	3
PRACTICALS								
8	23ME221	Engineering Practices Laboratory	ESC	0	0	4	4	2
9	23ES291	Soft Skill	HSMC	0	0	2	2	1*
TOTAL				**18**	**1**	**10**	**29**	**23**

SEMESTER III

SL. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
THEORY								
1.	23MA302	Transforms and Partial Differential Equations	BSC	3	1.	0	3	4
2.	23MT301	Manufacturing Technology	PCC	3	0	0	3	3
3.	23MT311	Electrical Drives and Actuators	PCC	3	0	0	3	3
4.	23HS301	Universal Human Values and Ethics	HSMC	3	0	0	3	3
THEORY AND PRACTICALS								
5.	23MT312	Digital Electronics and Microprocessor	PCC	3	0	2	5	4
6	23MT302	Kinematics and Dynamics of Machinery	PCC	3	0	2	5	4
PRACTICALS								
7.	23MT321	Manufacturing Technology Laboratory	PCC	0	0	4	4	2
8.	23MT322	Electrical Drives and Actuators Laboratory	PCC	0	0	4	4	2
9.	23ES391	Presentation Skills	EEC	0	0	2	2	1*
			TOTAL	**18**	**0**	**14**	**32**	**25**

SEMESTER IV

SL. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
THEORY								
1	23MA401	Optimization Techniques	BSC	3	1	0	4	4
2	23MT402	Sensors and Instrumentation	PCC	3	0	0	3	3
3	23MT403	Fluid Mechanics and Thermal Systems	PCC	3	0	0	3	3
4		Department Elective 1	DEC	3	0	0	3	3
5		Department Elective 2	DEC	3	0	0	3	3
THEORY AND PRACTICALS								
6	23CE412	Strength of Materials	PCC	3	0	2	5	4
PRACTICALS								
7	23MT421	Fluid Mechanics Laboratory	PCC	0	0	4	4	2
8	23MT422	Sensors and Instrumentation Laboratory	PCC	0	0	4	4	2
9	23ES491	Aptitude and Logical Reasoning - 1	EEC	0	0	2	2	1*
10	23MT423 /23MT424	Mini Project -1/ In Plant Training - 1	EEC	0	0	2	2	1
		TOTAL		**18**	**1**	**14**	**33**	**25**

SEMESTER V

SL. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK L	T	P	TOTAL CONTACT PERIODS	CREDITS
THEORY								
1	23RE501	Research Methodology and Intellectual Property Rights	ESC	2	0	0	2	2
2	23MT501	Robotics and Machine vision	PCC	3	0	0	3	3
3		Department Elective 3	DEC	3	0	0	3	3
4		Department Elective 4	DEC	3	0	0	3	3
5		Non-Department Elective-1 (Emerging Technology)	NEC	3	0	0	3	3
THEORY AND PRACTICALS								
6	23MT511	Control Systems Engineering	PCC	3	0	2	5	4
PRACTICALS								
7	23MT521	Robotics Laboratory	PCC	0	0	4	4	2
8	23MT522/ 23MT523	Mini Project – 2 /In-Plant Training -2	EEC	0	0	4	4	2
9	23ES591	Aptitude and Logical Reasoning - 2	EEC	0	0	2	2	1*
TOTAL				**17**	**0**	**12**	**29**	**22**

SEMESTER VI

SL. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK L	T	P	TOTAL CONTACT PERIODS	CREDITS
THEORY								
1		Department Elective 5	DEC	3	0	0	3	3
2		Department Elective 6	DEC	3	0	0	3	3
3		Non-Department Elective-2 (Management /Safety Courses)	NEC	3	0	0	3	3
THEORY AND PRACTICALS								
4	23CE611	Environmental Sciences and Engineering	ESC	3	0	2	5	4
5	23MT611	Industrial Automation	PCC	3	0	2	5	4
6	23MT612	Fluid power systems	PCC	3	0	2	5	4
PRACTICALS								
7	23MT621	Project Work - Phase 1	EEC	0	0	4	4	2
8	23MT622	Technical Training	EEC	0	0	2	2	1
9	23MT623	Technical Seminar - 1	ESC	0	0	2	2	1
TOTAL				**18**	**0**	**14**	**32**	**25**

SEMESTER VII

SL. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
THEORY								
1		Non-Department Elective-3 (Management Courses)	NEC	3	0	0	3	3
2	23MT701	Mechatronics System Design	PCC	3	0	0	3	3
3	23MT702	Embedded Systems and Programming	PCC	3	0	0	3	3
4	23MT703	Comprehension	EEC	2	0	0	2	2
THEORY AND PRACTICALS								
5	23MT702	Computer Aided Design and Manufacturing System	PCC	3	0	2	5	4
PRACTICALS								
6	23MT721	Project Work Phase -2	EEC	0	0	6	6	3
7	23MT722	Technical Seminar - 2	ESC	0	0	4	4	2
TOTAL				**14**	**0**	**12**	**26**	**20**

SEMESTER VIII

SL. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
PRACTICALS								
1	23MT821/ 23MT822	Internship /Capstone Project	EEC	0	0	20	20	10
TOTAL				**0**	**0**	**20**	**20**	**10**

Total credits: 171

PROFESSIONAL ELECTIVE COURSES: VERTICALS

VERTICAL1: APPLIED ROBOTICS

SL. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1	23MT031	Robots and Systems in Smart Manufacturing	DEC	3	0	0	3	3
2	23AE072	Drone Technologies	DEC	3	0	0	3	3
3	23MT033	Micro robotics	DEC	3	0	0	3	3
4	23MT034	Agricultural Robotics and Automation	DEC	3	0	0	3	3
5	23MT035	Collaborative Robotics	DEC	3	0	0	3	3
6	23MT036	Robot Operating Systems	DEC	3	0	0	3	3
7	23MT037	Medical Robotics	DEC	3	0	0	3	3
8	23MT038	Humanoid Robotics	DEC	3	0	0	3	3

VERTICAL2: DESIGN AND MANUFACTURING

SL. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1	23MT039	Robot and Machine Elements Design	DEC	3	0	0	3	3
2	23MT040	Design for X	DEC	3	0	0	3	3
3	23MT041	CNC Machine Tools and Programming	DEC	3	0	0	3	3
4	23ME033	Computer Integrated Manufacturing	DEC	3	0	0	3	3
5	23MT043	Advanced Manufacturing Systems	DEC	3	0	0	3	3
6	23ME031	Additive Manufacturing	DEC	3	0	0	3	3
7	23MT045	Electronics Manufacturing Technology	DEC	3	0	0	3	3
8	23MT046	Computer Aided Inspection and testing	DEC	3	0	0	3	3

VERTICAL 3: SMART MOBILITY SYSTEMS

SL. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1	23MT047	Automobile Engineering	DEC	3	0	0	3	3
2	23MT048	Electric and Hybrid Vehicles	DEC	3	0	0	3	3
3	23MT049	Automotive Mechatronics	DEC	3	0	0	3	3
4	23MT050	Automotive System Modeling and Simulation	DEC	3	0	0	3	3
5	23ME058	Vehicle Dynamics and Controls	DEC	3	0	0	3	3
6	23MT052	Aircraft Mechatronics	DEC	3	0	0	3	3
7	23ME058	Smart mobility and Intelligent Vehicles	DEC	3	0	0	3	3
8	23MT054	Advanced Driver Assistance systems	DEC	3	0	0	3	3

VERTICAL 4: INTELLIGENCE SYSTEMS

SL. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1	23MT055	Applied Signal Processing	DEC	3	0	0	3	3
2	23MT056	Applied Image Processing	DEC	3	0	0	3	3
3	23MT057	Machine Learning for Intelligent Systems	DEC	3	0	0	3	3
4	23MT058	Condition Monitoring and Fault Diagnostics	DEC	3	0	0	3	3
5	23MT059	Systems Modelling and Simulation Methods	DEC	3	0	0	3	3
6	23AE035	Design of UAV systems	DEC	3	0	0	3	3
7	23MT061	Immersive Technologies and Haptics	DEC	3	0	0	3	3
8	23MT062	Computer Vision and Deep Learning	DEC	3	0	0	3	3

VERTICAL 5: AUTOMATION

SL. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1	23AD301	OOPs in C++ and Java	DEC	3	0	0	3	3
2	23EE501	Power Electronics	DEC	3	0	0	3	3
3	23CS404	Computer Architecture	DEC	3	0	0	3	3
4	23MT066	Virtual Instrumentation	DEC	3	0	0	3	3
5	23MT067	Industrial Network Protocols	DEC	3	0	0	3	3
6	23MT068	Motion Control System	DEC	3	0	0	3	3
7	23MT069	Total Integrated Automation	DEC	3	0	0	3	3
8	23ME066	Digital Twin and Industry 5.0	DEC	3	0	0	3	3

VERTICAL 6: DIVERSIFIED GROUP 1

SL. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1	23MT071	Micro Electromechanical Systems	DEC	3	0	0	3	3
2	23MT072	Single Board Computers	DEC	3	0	0	3	3
3	23MT073	Reliability and Maintenance Engineering	DEC	3	0	0	3	3
4	23MT074	Medical Mechatronics	DEC	3	0	0	3	3
5	23MT075	Integrated Product Development	DEC	3	0	0	3	3
6	23MT076	Linear Integrated Circuits	DEC	3	0	0	3	3
7	23ME035	Process Planning and Cost Estimation	DEC	3	0	0	3	3
8	23MT078	VLSI and FPGA	DEC	3	0	0	3	3

NON-DEPARMENT ELECTIVE

EMERGING TECHNOLOGY

SL NO	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1	23NE971	Quantum Technology	NEC	3	0	0	3	3
2	23NE972	Block Chain Technology	NEC	3	0	0	3	3
3	23NE973	Artificial Intelligence and Machine Learning Fundamentals	NEC	3	0	0	3	3
4	23NE974	Augmented Reality and Virtual Reality	NEC	3	0	0	3	3
5	23NE975	IoT concepts and applications	NEC	3	0	0	3	3
6	23NE976	Data Science and Fundamentals	NEC	3	0	0	3	3
7	23NE977	Remote Sensing Concepts	NEC	3	0	0	3	3
8	23NE978	Urban Agriculture	NEC	3	0	0	3	3
9	23NE979	Nanotechnology	NEC	3	0	0	3	3
10	23NE980	Renewable Energy Systems	NEC	3	0	0	3	3
11	23NE982	Resource Management Techniques	NEC	3	0	0	3	3
12	23NE985	Introduction to Non-destructive Testing	NEC	3	0	0	3	3
13	23NE988	Electric and Hybrid Vehicles	NEC	3	0	0	3	3

MANAGEMENT COURSES

SL NO	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1	23HS971	Total Quality Management	NEC	3	0	0	3	3
2	23HS972	Engineering Economics and Financial Accounting	NEC	3	0	0	3	3
3	23HS973	Engineering Management and Law	NEC	3	0	0	3	3
4	23HS974	Knowledge Management	NEC	3	0	0	3	3
5	23HS975	Industrial Management	NEC	3	0	0	3	3
6	23HS976	Entrepreneurship and Business Opportunities	NEC	3	0	0	3	3
7	23HS977	Modern Business Administration and Financing	NEC	3	0	0	3	3
8	23HS978	Essentials of Management	NEC	3	0	0	3	3

SAFETY COURSES

SL NO	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1	23HS979	Disaster Management	NEC	3	0	0	3	3
2	23HS980	Industrial Safety	NEC	3	0	0	3	3
3	23HS981	Automotive Safety	NEC	3	0	0	3	3

Semester-wise Credit Distribution

SEMESTER	HSMC	BSC	ESC	PCC	DEC	NEC	EEC	Total
Semester I	**5**	**11**	**5**					**21**
Semester II	**4**	**7**	**9**	**3**				**23**
Semester III	**3**	**4**		**18**				**25**
Semester IV		**4**		**14**	**6**		**1**	**25**
Semester V			**2**	**9**	**6**	**3**	**2**	**22**
Semester VI			**5**	**8**	**6**	**3**	**3**	**25**
Semester VII			**2**	**10**		**3**	**5**	**20**
Semester VIII							**10**	**10**
Total Curriculum	**12**	**26**	**23**	**62**	**18**	**9**	**21**	**171**

Total credits: 171

23MA302 TRANSFORMS AND PARTIAL DIFFERENTIAL EQUATIONS

	L	T	P	C
23MA302 TRANSFORMS AND PARTIAL DIFFERENTIAL EQUATIONS	3	1	0	4

COURSE OBJECTIVES:

- To introduce the basic concepts of PDE for solving standard partial differential equations.
- To introduce Fourier series analysis which is central to many applications in engineering apart from its use in solving boundary value problems.
- To acquaint the student with Fourier series techniques in solving heat flow problems used in various situations.
- To acquaint the student with Fourier transform techniques used in wide variety of situations.
- To introduce the effective mathematical tools for the solutions of partial differential equations that model several physical processes and to develop Z transform techniques for discrete time systems.

UNIT I PARTIAL DIFFERENTIAL EQUATIONS 9+3

Formation of partial differential equations –Solutions of standard types of first order partial differential equations - Lagrange's linear equation - Linear partial differential equations of second and higher order with constant coefficients of both homogeneous and non-homogeneous types.

UNIT II FOURIER SERIES 9+3

Dirichlet's conditions – General Fourier series – Odd and even functions – Half range sine series and cosine series – Root mean square value – Parseval's identity – Harmonic analysis.

UNIT III APPLICATIONS OF PARTIAL DIFFERENTIAL EQUATIONS 9+3

Classification of second order Quasi Linear PDE – Method of separation of variables - Fourier series solutions of one dimensional wave equation – One dimensional equation of Heat conduction – Steady state solution of two dimensional equation of heat conduction (Infinite) (Cartesian coordinates only).

UNIT IV FOURIER TRANSFORMS 9+3

Statement of Fourier integral theorem– Fourier transform pair – Fourier sine and cosine transforms – Properties – Transforms of simple functions – Convolution theorem (Without proof) – Parseval's identity.

UNIT V Z-TRANSFORMS AND DIFFERENCE EQUATIONS 9+3

Z-transforms - Elementary properties – Convergence of Z-transforms – Initial and final value theorems - Inverse Z-transform using partial fraction and convolution theorem - Formation of difference equations – Solution of difference equations using Z - transforms.

TOTAL: 60 PERIODS

COURSE OUTCOMES:

At the end of the course the students will be able to

CO 1 Understand how to solve the given standard partial differential equations.

CO 2 Understand Fourier series analysis which plays a vital role in engineering applications.

CO 3 Examine the physical significance of Fourier series techniques in solving one and two dimensional heat flow problems and one dimensional wave equations.

CO 4 Understand the mathematical principles on Fourier transforms to solve some of the physical problems of engineering.

CO 5 Understand Z transforms , inverse Z transforms and its elementary properties

CO 6 Apply the effective mathematical tools for the solutions of difference equations by using Z transform techniques for discrete time systems.

TEXT BOOKS:

1. Kreyszig.E, "Advanced Engineering Mathematics", John Wiley and Sons, 10th Edition, New Delhi, 2016.
2. Grewal.B.S., "Higher Engineering Mathematics", Khanna Publishers, New Delhi, 44th Edition, 2018.
3. P.Sivaramakrishna Das and C.Vijayakumari "A Text Book on TPDE" Pearson Publications.

REFERENCE BOOKS:

1. Narayanan. S., Manicavachagom Pillay.T.K and Ramanaiah.G "Advanced Mathematics for Engineering Students", Vol. II & III, S.Viswanathan Publishers Pvt. Ltd, Chennai, 1998.
2. Ramana. B.V., "Higher Engineering Mathematics", McGraw Hill Education Pvt. Ltd, New Delhi, 2018.

COs	**POs**												**PSOs**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
1	3	3	3	-	-	-	-	-	-	-	-	2	2	-	1
2	3	3	3	-	-	-	-	-	-	-	-	2	2	-	1
3	2	2	2	-	-	-	-	-	-	-	-	2	2	-	1
4	3	3	3	-	-	-	-	-	-	-	-	2	2	-	1
5	2	2	2	-	-	-	-	-	-	-	-	2	2	-	1
6	2	2	2	-	-	-	-	-	-	-	-	2	2	-	1
Overall correlation	3	3	2	-	-	-	-	-	-	-	-	2	2	-	1

23MT301 MANUFACTURING TECHNOLOGY

L	T	P	C
3	0	0	3

COURSE OBJECTIVES:

- To study the concepts and basic mechanics of metal cutting and the factors affecting machinability.
- To learn working of basic and advanced turning machines.
- To teach the basics of machine tools with reciprocating and rotating motions and abrasive finishing processes.
- To study the basic concepts of CNC of machine tools and constructional features of CNC.
- To learn the basics of CNC programming concepts to develop the part program for Machine centre and turning centre.

UNIT I MECHANICS OF METAL CUTTING 9

Mechanics of chip formation, forces in machining, Types of chips, cutting tools – single point cutting tool nomenclature, orthogonal and oblique metal cutting, thermal aspects, cutting tool materials, tool wear, tool life, surface finish, cutting fluids and Machinability.

UNIT II TURNING MACHINES 9

Centre lathe, constructional features, specification, operations – taper turning methods, thread cutting methods, special attachments, surface roughness in turning, machining time and power estimation. Special lathes - Capstan and turret lathes- tool layout – automatic lathes: semi- automatic – single spindle: Swiss type, automatic screw type – multi spindle.

UNIT III RECIPROCATING MACHINE TOOLS 9

Reciprocating machine tools: shaper, planer, slotter: Types and operations- Hole making: Drilling, reaming, boring, tapping, type of milling operations-attachments- types of milling cutters– machining time calculation - Gear cutting, gear hobbing and gear shaping – gear finishing methods Abrasive processes: grinding wheel – specifications and selection, types of grinding process – cylindrical grinding, surface grinding, centreless grinding, internal grinding - micro finishing methods.

UNIT IV CNC MACHINES 10

Computer Numerical Control (CNC) machine tools, constructional details, special features – Drives, Recirculating ball screws, tool changers; CNC Control systems – Open/closed, point-to- point/continuous - Turning and machining centres – Work holding methods in Turning and machining centres, Coolant systems, Safety features.

UNIT V PROGRAMMING OF CNC MACHINE TOOLS 8

Coordinates, axis and motion, Absolute vs Incremental, Interpolators, Polar coordinates, Program planning, G and M codes, Manual part programming for CNC machining centers and Turning centers – Fixed cycles, Loops and subroutines, Setting up a CNC machine for machining.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

At the end of the course the students will be able to

CO1: Apply the mechanism of metal removal process and to identify the factors involved in improving machinability.

CO2: Describe the constructional and operational features of centre lathe and other special purpose lathes.

CO3: Describe the constructional and operational features of reciprocating machine tools.

CO4: Apply the constructional features and working principles of CNC machine tools.

CO5: Demonstrate the Program CNC machine tools through planning, writing codes and setting up CNC machine tools to manufacture a given component.

TEXT BOOKS:

1. Kalpakjian. S, "Manufacturing Engineering and Technology", Pearson Education India 8th Edition, 2020.
2. Michael Fitzpatrick, Machining and CNC Technology, McGraw-Hill Education; 4th edition, 2019.

REFERENCE BOOKS:

1. Roy. A. Lindberg, Processes and materials of manufacture, PHI / Pearson education, 3rd edition 2015.
2. Geofrey Boothroyd, "Fundamentals of Metal Machining and Machine Tools", McGraw Hill, 3rd edition 2005.
3. Rao. P.N "Manufacturing Technology," Metal Cutting and Machine Tools, Tata McGraw- Hill, New Delhi, 4th Edition 2018.
4. A. B. Chattopadhyay, Machining and Machine Tools, Wiley, 2nd edition, 2017.

COs	POs												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	3	3	3	-	-	-	3	-	1	3	2	2	3	3	2
2	3	3	3	-	-	-	3	-	2	3	1	2	3	2	2
3	2	3	3	-	-	-	3	-	1	2	1	2	3	2	2
4	3	3	2	-	-	-	3	-	1	3	2	2	3	2	2
5	3	3	3	-	-	-	3	-	1	3	1	2	3	2	3
Overall Correlation	3	3	3	-	-	-	3	-	1	3	1	2	3	2	3

23MT311 ELECTRICAL DRIVES AND ACTUATORS

L	T	P	C
3	0	0	3

COURSE OBJECTIVES:

The learning objective of this course is

- To familiarize a relay and power semiconductor devices
- To get a knowledge on drive characteristics
- To obtain the knowledge on DC motors and drives.
- To obtain the knowledge on AC motors and drives.
- To obtain the knowledge on Stepper and Servo motor.

UNIT I RELAY AND POWER SEMI-CONDUCTOR DEVICES 9

Study of Switching Devices- Relay and its Types, Switching characteristics -BJT, SCR, TRIAC, GTO, MOSFET, IGBT and IGCT. Introduction to Triggering, Commutation Driver and snubber circuits.

UNIT II DRIVE CHARACTERISTICS 9

Electric drive – Equations governing motor load dynamics – steady state stability – multi quadrant Dynamics: acceleration, deceleration, torque, and Direction starting & stopping – Selection of motor.

UNIT III DC MOTORS AND DRIVES 9

DC Servomotor - Types of PMDC & BLDC motors - principle of operation- emf and torque equations - characteristics and control – Drives- H bridge (Single Phase) – 4 quadrant operation – Applications

UNIT IV AC MOTORS AND DRIVES 9

Introduction – Induction motor drives – Speed control of 3-phase induction motor – Stator voltage control – Stator frequency control – Stator voltage and frequency control – Stator current control – Static rotor resistance control – Slip power recovery control.

UNIT V TURNING, GEAR CUTTING, SHAPING AND FINISHING PROCESSES 9

Stepper Motor: Classifications- Construction and Principle of Operation – Modes of Excitation- Drive System-Logic Sequencer - Applications. Servo Mechanism – DC Servo motor-AC Servo motor – Applications.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

At the end of the course the students will be able to

CO 1: Recognize the principles and working of relays, drives, and motors.

CO 2: Explain the working and characteristics of various drives and motors.

CO 3: Apply the solid-state switching circuits to operate various types of Motors and Drivers.

CO 4: Interpret the performance of Motors and Drives.

CO 5: Suggest the Motors and Drivers for given applications.

TEXT BOOKS:

1. Bimbhra B.S., "Power Electronics", 5th Edition, Kanna Publishers, New Delhi, 2012.
2. Mehta V.K. & Rohit Mehta, "Principles of Electrical Machines", 2nd Edition, S.Chand& Co. Ltd.,New Delhi, 2016.

REFERENCE BOOKS:

1. Gobal K. Dubey, "Fundamentals of Electrical Drives", 2nd Edition, Narosal Publishing House,New Delhi, 2001.
2. Theraja B.L. &Theraja A.K., "A Text Book of Electrical Technology", 2nd Edition, S.Chand&Co. Ltd., New Delhi, 2012.
3. Singh M.D. &Kanchandhani K.B., "Power Electronics", McGraw Hill, New Delhi, 2007.
4. Andre Veltman , Duco W.J. Pulle , R.W. de Doncker , * Fundamentals of Electrical Drives (Power Systems)”,Springer International Publishing AG; Softcover reprint of the original 2nd ed. 2016 edition.

COs	POs												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	3	-	1	2	1	-	-	-	-	-	-	-	1	-	3
2	3	-	2	2	1	-	-	-	-	-	-	-	1	-	3
3	3	-	2	2	1	-	-	-	-	-	-	-	1	-	3
4	3	-	1	2	2	-	-	-	-	-	-	-	1	-	3
5	3	-	1	2	2	-	-	-	-	-	-	-	1	-	3
Overall Correlation	3	-	1.4	2	1.4	-	-	-	-	-	-	-	1	-	3

23HS301 UNIVERSAL HUMAN VALUES AND ETHICS

L	T	P	C
3	0	0	3

COURSE OBJECTIVES:

- Development of a holistic perspective based on self-exploration about themselves (human being), family, society and nature/existence.
- Understanding (or developing clarity) of the harmony in the human being, family, society and nature/existence.
- Strengthening of self-reflection.
- Development of commitment and courage to act.

UNIT I COURSE INTRODUCTION 9

Need, Basic Guidelines, Content and Process for Value Education - Understanding the need, basic guidelines, content and process for Value Education -Self Exploration–what is it? - its content and process; 'Natural Acceptance' and Experiential Validation- as the mechanism for self exploration - Continuous Happiness and Prosperity- A look at basic Human Aspirations -Right understanding, Relationship and Physical Facilities- the basic requirements for fulfilment of aspirations of every human being with their correct priority -Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario -Method to fulfil the above human aspirations: understanding and living in harmony at various levels.

UNIT II UNDERSTANDING HARMONY IN THE HUMAN BEING 9

Harmony in Myself- Understanding human being as a co-existence of the sentient 'I' and the material 'Body' -Understanding the needs of Self ('I') and 'Body' - Sukh and Suvidha- Understanding the Body as an instrument of 'I' (I being the doer, seer and enjoyer) - Understanding the characteristics and activities of 'I' and harmony in 'I' -Understanding the harmony of I with the Body: Sanyam and Swasthya; correct appraisal of Physical needs, meaning of Prosperity.

UNIT III UNDERSTANDING HARMONY IN THE FAMILY AND SOCIETY 9

Harmony in Human-Human Relationship -Understanding Harmony in the family – the basic unit of human interaction -Understanding values in human-human relationship; meaning of Nyaya and program for its fulfilment to ensure satisfaction; Trust(Vishwas) and Respect as the foundational values of relationship -Understanding the meaning of Vishwas; Difference between intention and competence -Understanding the meaning of Samman, Difference between respect and differentiation; the other salient values in relationship -Understanding the harmony in the society (society being an extension of family)-Visualizing a universal harmonious order in society- Undivided Society (Akhand Samaj), Universal Order- from family to world family.

UNIT IV ENGINEERING ETHICS **9**

Senses of ‗Engineering Ethics„ – Variety of moral issues – Types of inquiry – Moral dilemmas – Moral Autonomy – Kohlberg's theory – Gilligan's theory – Consensus and Controversy – Models of professional roles - Theories about right action – Self-interest – Customs and Religion – Uses of Ethical Theories.

UNIT V SAFETY, RESPONSIBILITY AND RIGHTS **9**

Safety and Risk – Assessment of Safety and Risk – Risk Benefit Analysis and Reducing Risk - Respect for Authority – Collective Bargaining – Confidentiality – Conflicts of Interest – Occupational Crime – Professional Rights – Employee Rights – Intellectual Property Rights (IPR) – Discrimination-Moral Leadership –Code of Conduct – Corporate Social Responsibility.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

At the end of the course the students will be able to

CO1: Understand the need of value education.

CO2: Comprehend the difference between self and body.

CO3: Understand the need to exist as an unit of Family and society.

CO4: Understand Harmony at all levels.

CO5: Apply the values acquired in the professional front.

CO6: Identify appropriate technologies for ecofriendly production systems.

TEXT BOOKS:

1. Human Values and Professional Ethics by R R Gaur, R Sangal, G P Bagaria, Excel Books, New Delhi, 2010 3.
2. Mike W. Martin and Roland Schinzinger, ―Ethics in Engineering‖, Tata McGraw Hill, New Delhi, 2003.
3. Govindarajan M, Natarajan S, Senthil Kumar V. S, ―Engineering Ethics‖, Prentice Hall of India, New Delhi, 2004

REFERENCE BOOKS:

1. Jeevan Vidya: Ek Parichaya, A Nagaraj, Jeevan Vidya Prakashan, Amarkantak, 1999.
2. Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004.
3. The Story of Stuff (Book).
4. The Story of My Experiments with Truth - by Mohandas Karamchand Gandhi AICTE Model Curriculum in Humanities, Social Science and Management Courses (UG Engineering & Technology) 169 | Page .
5. Small is Beautiful - E. F Schumacher.
6. Slow is Beautiful - Cecile Andrews.
7. Economy of Permanence - J C Kumarappa 8. Bharat Mein Angreji Raj – Pandit

Sunderlal.
8. Rediscovering India - by Dharampal.
9. Hind Swaraj or Indian Home Rule - by Mohandas K. Gandhi .
10. India Wins Freedom - Maulana Abdul Kalam Azad.
11. Vivekananda - Romain Rolland (English) 13. Gandhi - Romain Rolland (English).
12. Charles B. Fleddermann, ―Engineering Ethics‖, Pearson Prentice Hall, New Jersey, 2004.
13. Charles E. Harris, Michael S. Pritchard and Michael J. Rabins, ―Engineering Ethics – Concepts and Cases‖, Cengage Learning, 2009.

WEB SOURCES:

1. www.onlineethics.org
2. www.nspe.org
3. www.globalethics.org

COs	**POs**												**PSOs**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
1	-	-	-	-	-	3	3	3	3	3	-	-	-	-	3
2	-	-	-	-	-	3	3	3	3	3	-	-	-	-	3
3	-	-	-	-	-	3	3	3	3	3	-	-	-	-	3
4	-	-	-	-	-	3	3	3	3	3	-	-	-	-	3
5	-	-	-	-	-	3	3	3	3	3	-	-	-	-	3
6	-	-	-	-	-	3	3	3	3	3	-	-	-	-	3
Overall correlation	-	-	-	-	-	3	3	3	3	3	-	-	-	-	3

23MT312 DIGITAL ELECTRONICS AND MICROPROCESSOR

L	T	P	C
3	0	2	4

COURSE OBJECTIVES:

- To present the Digital fundamentals, Boolean algebra and its applications in digital systems.
- To familiarize with the design of various combinational digital circuits using logic gates.
- To introduce the analysis and design procedures for synchronous and asynchronous sequential circuits.
- To explain the various semiconductor memories and related technology.
- To introduce the electronic circuits involved in the making of logic gate.

UNIT I DIGITAL FUNDAMENTALS 9

Number Systems – Decimal, Binary, Octal, Hexadecimal, 1's and 2's complements, Codes – Binary, BCD, Excess 3, Gray, Alphanumeric codes, Boolean theorems, Logic gates, Universal gates, Sum of products and product of sums, Minterms and Maxterms, Karnaugh map Minimization and Quine McCluskey method of minimization.

UNIT II COMBINATIONAL & SYNCHRONOUS SEQUENTIAL CIRCUITS 9

Design of Half and Full Adders, Half and Full Subtractors, Binary Parallel Adder - Multiplexer, Demultiplexer, Decoder, Priority Encoder. Flip flops – SR, JK, T, D, design of clocked sequential circuits – Design of Counters- Shift registers, Universal Shift Register.

UNIT III ASYNCHRONOUS SEQUENTIAL CIRCUITS AND MEMORY DEVICES 9

Stable and Unstable states, output specifications, cycles and races, state reduction, race free assignments, Hazards, Essential Hazards, Pulse mode sequential circuits, Design of Hazard free circuits. Basic memory structure – ROM -PROM – EPROM – EEPROM – EAPROM, RAM – Static and dynamic RAM - Programmable Logic Devices – Programmable Logic Array (PLA) - Programmable Array Logic (PAL) – Field Programmable Gate Arrays (FPGA).

UNIT IV 8085 PROCESSOR 9

Hardware Architecture, pin diagram – Functional Building Blocks of Processor – Memory organization – I/O ports and data transfer concepts– Timing Diagram – Interrupts.

UNIT V PROGRAMMING PROCESSOR 9

Instruction - format and addressing modes – Assembly language format – Data transfer, data manipulation& control instructions – Programming: Loop structure with counting & Indexing – Look up table - Subroutine instructions – stack -8255 architecture and operating modes.

TOTAL: 45 PERIODS

LIST OF EXPERIMENTS

1. Truth Table Verification of Logic gates.
2. Implementation of Boolean expression using K-map and logic gates.
3. Design and implementation of code converters.
4. Design of Full adders using logic gates.
5. Design of Full subtractors using logic gates.
6. Design and Implementation of Shift Registers.
7. Design and implementation of counters using flip-flops.
8. Simple arithmetic operations: Multi precision addition / subtraction /multiplication / division.
9. Programming with control instructions: Increment / Decrement, Ascending / Descending.
10. Program with subroutines.

COURSE OUTCOMES:

At the end of the course the students will be able to

CO1: State the fundamental operating concepts behind digital logic circuits and microprocessors.

CO 2: Recognize the use of various digital logic circuits and sub units in microprocessors.

CO 3: Sketch the digital logic circuits and the architectures of microprocessors.

CO 4: Design the DLC and Microprocessor for the standard applications.

CO 5: Create the circuits using DLC and Microprocessor for given applications.

TEXT BOOKS:

1. M.Morris Mano and Michael D.Ciletti, "Digital Design", 5th Edition, Pearson, 2014
2. Krishna Kant, "Microprocessor and Microcontrollers", Eastern Company Edition, Prentice Hall of India, New Delhi, 2007.

REFERENCE BOOKS:

1. Charles H.Roth. "Fundamentals of Logic Design", 6th Edition,Thomson Learning, 2013.
2. Thomas L. Floyd, "Digital Fundamentals", 10th Edition, Pearson Education Inc, 2011.
3. Muhammad Ali Mazidi & Janice Gilli Mazidi, R.D.Kinely 'The 8051 Micro Controller and Embedded Systems', PHI Pearson Education, 5th Indian reprint, 2003.
4. R.S. Gaonkar, 'Microprocessor Architecture Programming and Application', with 8085, Wiley Eastern Ltd., New Delhi, 2013.

COs	**POs**												**PSOs**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
1	3	3	2	2	1	2	2	1	2	1	1	1	3	2	2
2	3	3	2	2	1	2	2	1	2	1	1	1	3	2	2
3	3	3	2	2	1	2	2	1	2	1	1	1	3	2	2
4	3	3	2	2	1	2	2	1	2	1	1	1	3	2	2
5	3	3	2	2	1	2	2	1	2	1	1	1	3	2	2
Overall correlation	3	3	2	2	1	2	2	1	2	1	1	1	3	2	2

23MT302	KINEMATICS AND DYNAMICS OF MACHINERY	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To understand the basic components and layout of linkages in the assembly of a system/ machine and also learn about the mechanisms.
- To understand the basic concepts of toothed gearing and kinematics of gear trains and the effects of friction in motion transmission and in machine components.
- To learn about the concepts in friction.
- To understand the principles in force analysis.
- To learn about the basic concept of static and dynamic balancing and vibration

UNIT I KINEMATICS OF MACHINES 10

Mechanisms – Terminology and definitions – kinematics inversions of 4 bar and slider crank chain kinematics analysis in simple mechanisms – velocity and acceleration polygons (Relative velocity method) Coriolis component of Acceleration.

UNIT II GEARS AND GEAR TRAINS 9

Spur gear – law of toothed gearing – involute gearing – Interchangeable gears – Gear tooth action interference and undercutting – nonstandard teeth – gear trains – parallel axis gears trains – epicyclic gear trains..

UNIT III CAM AND FRICTION DRIVES 9

Cams – classifications – displacement diagrams - layout of plate cam profiles – derivatives of follower motion – circular arc and tangent cams. Sliding and Rolling Friction angle – friction in threads – Friction Drives – Belt and rope drives.

UNIT IV FORCE ANALYSIS 8

Static Force analysis in simple machine members – Dynamic Force Analysis Inertia Forces and Inertia Torque – D'Alembert's principle – superposition principle – dynamic Force Analysis in simple machine members.

UNIT V BALANCING AND VIBRATION 9

Static and Dynamic balancing – Balancing of revolving and reciprocating masses – Balancing machines – free vibrations – Equations of motion – natural Frequency – Damped Vibration – critical speed of simple shaft.

TOTAL:45 PERIODS

LIST OF EXPERIMENTS

1. Coriolis Component of Acceleration
2. Determination of Mass moment of inertia of Fly wheel and Axle system.
3. Cams – Cam profile drawing, Motion curves and study of jump phenomenon

4. Determination of torsional natural frequency of single and Double Rotor systems. - Undamped Natural frequencies.
5. Vibration of Equivalent Spring mass system – undamped vibration.
6. Whirling of shafts – Determination of critical speeds of shafts with concentrated loads.
7. Transverse vibration of Free-Free beam – with and without concentrated masses.

TOTAL: 30 PERIODS

COURSE OUTCOMES:

At the end of the course the students will be able to

CO1: Recognize the basic terminologies of kinematics and dynamics of machines

CO2: Interpret the various concepts of kinematics and dynamics including forces and frictions

CO 3: Show the motions parameters on the various mechanisms, gears and gear trains**.**

CO 4: Apply the mechanism, gears and gear train for the design of new machines.

CO 5: Analyze the working of various mechanism, gears and gear train.

TEXT BOOKS:

1. Rattan, S.S, "Theory of Machines", 4th Edition, Tata McGraw-Hill, 2014.
2. Bansal R.K., "Theory of Machines", Laxmi Publications Pvt Ltd., New Delhi, 20th edition,2009

REFERENCE BOOKS:

1. Thomas Bevan, "Theory of Machines", CBS Publishers and Distributors, 1984.
2. Ghosh. A, and A.K. Mallick, "Theory and Machine", Affiliated East-West Pvt. Ltd., New Delhi,1988.
3. Ramamurthi, Mechanisms of Machine, Narosa Publishing House, 2002.
4. Ambekar A. G., "Mechanism and Machine Theory" Prentice Hall of India,New Delhi, 2007.

COs	POs												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	3	2	1	1	2	2	-	-	-	-	-	1	2	1	3
2	3	2	1	1	2	2	-	-	-	-	-	1	2	1	3
3	3	2	1	1	2	2	-	-	-	-	-	1	2	1	3
4	3	2	1	1	2	2	-	-	-	-	-	1	2	1	3
5	3	2	1	1	2	2	-	-	-	-	-	1	2	1	3
6	3	2	1	1	2	2	-	-	-	-	-	1	2	1	3
Overall Correlation.	3	2	1	1	2	2	-	-	-	-	-	1	2	1	3

23MT321 MANUFACTURING TECHNOLOGY LABORATORY

L	T	P	C
0	0	4	2

COURSE OBJECTIVES:

- To Selecting appropriate tools, equipment's and machines to complete a given job.
- To Performing various welding process using GMAW and fabricating gears using gear making machines.
- To Performing various machining process such as rolling, drawing, turning, shaping, drilling, milling and analyzing the defects in the cast and machined components.

LIST OF EXPERIMENTS

1. Fabricating simple structural shapes using Gas Metal Arc Welding machine.
2. Preparing green sand moulds with cast patterns.
3. Taper Turning and Eccentric Turning on circular parts using lathe machine.
4. Knurling, external and internal thread cutting on circular parts using lathe machine.
5. Shaping – Square and Hexagonal Heads on circular parts using shaper machine.
6. Drilling and Reaming using vertical drilling machine.
7. Milling contours on plates using vertical milling machine.
8. Cutting spur and helical gear using milling machine.
9. Generating gears using gear Hobbing machine.
10. Generating gears using gear shaping machine.
11. Grinding components using cylindrical and centerless grinding machine.
12. Grinding components using surface grinding machine.
13. Cutting force calculation using dynamometer in milling machine
14. Cutting force calculation using dynamometer in lathe machine

TOTAL:60 PERIODS

COURSE OUTCOMES:

At the end of the course, students will be able to

- Demonstrate the safety precautions exercised in the mechanical workshop and join two metals using GMAW.
- The students able to make the work piece as per given shape and size using machining process such as rolling, drawing, turning, shaping, drilling and milling.
- The students become make the gears using gear making machines and analyze the defects in the cast and machined components.

COs	POs												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	3	-	-	-	-	-	1	-	2	-	-	1	1	1	1
2	3	-	-	-	-	-	1	-	2	-	-	1	1	1	1
3	3	-	-	-	-	-	1	-	2	-	-	1	1	1	1
Overall Correlation	3	-	-	-	-	-	1	-	2	-	-	1	1	1	1

23MT322 ELECTRICAL DRIVES AND ACTUATORS LABORATORY

L	T	P	C
0	0	4	2

COURSE OBJECTIVES:

- To impart knowledge on Performance of the fundamental control practices associated with AC and DC machines (starting, reversing, braking, plugging, etc.) using power electronics To impart industry-oriented learning
- To evaluate the use of computer-based analysis tools to review the major classes ofmachines and their physical basis for operation

LIST OF EXPERIMENTS

1. Load test on DC Motor.
2. Load test on 3-phase Induction Motor.
3. Load test on 3-Phase Synchronous Motor.
4. Rheostat-based Speed control of motors (AC and DC).
5. Switching circuits of MOSFET, IGBT, SCR and TRAIC.
6. Gate pulsation generation using PWM signals.
7. Speed control of DC motor using Power Electronic Drive.
8. Position, Direction, and speed control of stepper Motor.
9. Position and direction control DC servomotor.
10. VFD controls single-phase and three-phase induction motors using Power Electronic Drive.
11. Position, direction, and speed control of BLDC and PMDC motors using Power Electronic drive.

TOTAL:60 PERIODS

COURSE OUTCOMES:

At the end of the course, students will be able to

CO1: Practice the basic working of AC, DC motor, stepper motor, servo motor, and synchronous motor using power electronic drive

CO2: Demonstrate the control of AC, DC motor, stepper motor, servo Motor and synchronous motor using power electronic drive

CO3: Analyze the performance of AC, DC motor, stepper motor, servo motor and synchronous motor using power electronic drive.

COs	POs												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	3	2	1	1	1	-	-	-	-	-	-	1	2	2	3
2	3	2	1	1	1	-	-	-	-	-	-	1	2	2	3
3	3	2	1	1	1	-	-	-	-	-	-	1	2	2	3
Overall Correlation	3	2	1	1	1	-	-	-	-	-	-	1	2	2	3

23ES391 PRESENTATION SKILLS

L	T	P	C
0	0	2	1*

COURSE OBJECTIVES:

- To help learners use brainstorming techniques for generating, organizing and outlining ideas.
- To familiarize learners with different speech structures by engaging them in watching speeches with great opening and closing.
- To give practice on voice modulation and use of body language and eye contact for making captivating presentations.
- To give hands on training on preparing presentation slides and using remote presentation tools.
- To train students on responding to question and feedback with confidence.

UNIT I BRAINSTORMING AND OUTLINING 6

Mind Mapping based on prior knowledge, collecting additional information from external resources, giving prompts to Generative AI tools seeking information, organizing ideas generated, knowing your audience.

UNIT II STRUCTURING THE PRESENTATION 6

3 Ts of a presentation, writing effective introduction- Beginning the introduction with a hook (question, data, storytelling) and closing the introduction with the objective of the presentation. Structuring the body paragraphs -Choosing key ideas from the list of ideas generated during brainstorming. Substantiating ideas with examples, data, reasons and anecdotes. Summarizing the ideas for conclusion.

UNIT III DELIVERY TECHNIQUES 6

Vocal variety, intonation, reducing filler words and improving articulation, inflection, engaging the audience. Body language- eye contact, gestures, movement on stage.

UNIT IV USE OF TECHNOLOGICAL AIDS 6

Use of presentation software like MS Power Point, Google Slides etc, incorporating images, graphs, charts and videos, using interactive tools like quizzes and polls, using remote presentation tools like zoom, MS Teams, WebEx for screen sharing, virtual whiteboards and chat functionalities, incorporating AR/VR for more immersive presentations .

UNIT V HANDLING QUESTIONS AND FEEDBACK 6

Audience engagement through questions, PAR (Point, Answer, Redirect) strategy for structuring responses to questions. Understanding feedback process - Receiving, interpreting and evaluating constructively, active listening techniques for processing feedback, responding to feedback- acknowledging, clarifying and appreciating, Dealing with challenging feedback.

TOTAL: 30 PERIODS

COURSE OUTCOMES:

After completion of the course, the students should be able to

CO1 construct ideas for presentation through mind mapping techniques.

CO2 organize ideas and structure the presentation with captivating introduction, body paragraphs illustrated with examples and reasons and compelling conclusion.

CO3 apply vocal variety and body language techniques to enhance delivery.

CO4 prepare engaging presentations by integrating multimedia elements.

CO5 demonstrate proficiency in delivering presentations in remote platforms utilizing various technological tools and strategies to engage audience in virtual environments.

CO6 exhibit active listening skills by responding to questions with clarity and confidence and incorporating constructive feedback for professional development.

TEXT BOOKS:

1. "Slide:ology: The Art and Science of Creating Great Presentations" by Nancy Duarte. O'Reilly Media
2. "The Naked Presenter: Delivering Powerful Presentations With or Without Slides" by Garr Reynolds. New Riders

REFERENCE BOOK:

Talk Like TED: The 9 Public-Speaking Secrets of the World's Top Minds" by Carmine Gallo.

23MA401 OPTIMIZATION TECHNIQUES

L	T	P	C
3	1	0	4

COURSE OBJECTIVES:

- Formulate and solve linear programming problems (LPP)
- Evaluate Transportation and Assignment Problems
- Obtain solution to network problems using CPM and PERT techniques.
- Optimize the function subject to the constraints

UNIT I LINEAR PROGRAMMING MODELS 9+3

Introduction of Operations Research - mathematical formulation of LPP-Graphical Methods to solve LPP- Simplex Method- Big M method, Two phase method.

UNIT II TRANSPORTATION PROBLEMS AND ASSIGNMENT PROBLEMS 9+3

Transportation problem (TP) - finding basic feasible solution of TP using North-West Corner Rule, Least Cost and Vogel's Approximation Method - MODI method for finding optimal solution for TP - Assignment problem - Hungarian method for solving Assignment problem - Travelling salesman problem as assignment problem – Production Scheduling problem – Introduction, Problems in single machine scheduling.

UNIT III INVENTORY CONTROL 9+3

Introduction, Models – Problems in Purchase and Production (Manufacturing) models with and without shortages – Theory on types of inventory control systems: P& Q, ABC, VED, FNS, XYZ, SDE and HML.

UNIT IV PROJECT MANAGEMENT 9+3

Project definition - Gantt chart - Project network - Diagram representation – Floats - Critical path method (CPM) – PERT- Cost considerations in PERT and CPM.

UNIT V CLASSICAL OPTIMIZATION THEORY 9+3

Unconstrained problems – necessary and sufficient conditions - Newton-Raphson method, Constrained problems – equality constraints – inequality constraints - Kuhn-Tucker conditions.

TOTAL: 60 PERIODS

COURSE OUTCOMES:

At the end of the course the students will be able to

CO 1 Formulate and solve linear programming problems (LPP).
CO 2 Examine Transportation Problems.
CO 3 Examine Assignment Problems.
CO 4 Plan the purchase/ manufacturing policies to meet customer demands.
CO 5 Obtain solution to network problems using CPM and PERT Techniques.
CO 6 Optimize the function subject to the constraints.

TEXT BOOKS:

1. Hamdy A Taha, Operations Research: An Introduction, Pearson, 10th Edition, 2017.
2. R. Pannerselvan, Operations Research, 2nd Edition, PHI Publications, 2006.

REFERENCE BOOKS:

1. Dontzig G.B, Linear Programming and extensions, Princeton University Press.
2. ND Vohra, Quantitative Techniques in Management, Tata McGraw Hill, 4th Edition, 2011.
3. J. K. Sharma, Operations Research Theory and Applications, Macmillan, 5th Edition, 2012.

COs	**POs**												**PSOs**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
1	3	3	2	1	-	-	-	-	-	-	1	2	1	-	-
2	3	3	2	1	-	-	-	-	-	-	1	2	1	-	-
3	3	3	2	1	-	-	-	-	-	-	1	2	1	-	-
4	3	3	2	1	-	-	-	-	-	-	1	2	1	-	-
5	3	3	2	1	-	-	-	-	-	-	1	2	1	-	-
6	3	3	2	1	-	-	-	-	-	-	1	2	1	-	-
Overall correlation	3	3	2	1	-	-	-	-	-	-	1	2	1		

23MT402 SENSORS AND INSTRUMENTATION

L	T	P	C
3	0	0	3

COURSE OBJECTIVES:

- To understand the concepts of measurement technology.
- To learn the various sensors used to measure various physical parameters.
- To learn the fundamentals of signal conditioning, data acquisition and communicationsystems used in mechatronics system development.
- To learn about the optical, pressure and temperature sensor.
- To understand the signal conditioning and DAQ systems.

UNIT I INTRODUCTION 9

Basics of Measurement – Classification of errors – Error analysis – Static and dynamic characteristics of transducers – Performance measures of sensors – Classification of sensors – Sensor calibration techniques – Sensor Output Signal Types.

UNIT II MOTION, PROXIMITY AND RANGING SENSORS 9

Motion Sensors – Potentiometers, Resolver, Encoders – Optical, Magnetic, Inductive, Capacitive, LVDT – RVDT – Synchro – Microsyn, Accelerometer – GPS, Bluetooth, Range Sensors – RF beacons, Ultrasonic Ranging, Reflective beacons, Laser Range Sensor (LIDAR).

UNIT III FORCE, MAGNETIC AND HEADING SENSORS 8

Strain Gage, Load Cell, Magnetic Sensors –types, principle, requirement and advantages: Magneto resistive – Hall Effect – Current sensor Heading Sensors – Compass, Gyroscope,Inclinometers.

UNIT IV OPTICAL, PRESSURE AND TEMPERATURE SENSORS 10

Photo conductive cell, photo voltaic, Photo resistive, LDR – Fiber optic sensors – Pressure – Diaphragm, Bellows, Piezoelectric – Tactile sensors, Temperature – IC, Thermistor, RTD, Thermocouple. Acoustic Sensors – flow and level measurement, Radiation Sensors - Smart Sensors - Film sensor, MEMS & Nano Sensors, LASER sensors.

UNIT V SIGNAL CONDITIONING AND DAQ SYSTEMS 9

Amplification – Filtering – Sample and Hold circuits – Data Acquisition: Single channel and multi- channel data acquisition – Data logging - applications - Automobile, Aerospace, Home appliances, Manufacturing, Environmental monitoring.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

At the end of the course the students will be able to

CO1: Recognize with various calibration techniques and signal types for sensors.

CO2: Describe the working principle and characteristics of force, magnetic, heading pressure and temperature, smart and other sensors and transducers.

CO3: Apply the various sensors and transducers in various applications.

CO4: Select the appropriate sensor for different applications.

CO5: Acquire the signals from different sensors using Data acquisition systems.

TEXT BOOKS:

1. Ernest O Doebelin, "Measurement Systems – Applications and Design", Tata McGraw-Hill,2009.
2. Sawney A K and Puneet Sawney, "A Course in Mechanical measurements and Instrumentation and Control", 12^{th} edition, Dhanpat Rai & Co, New Delhi, 2013.

REFERENCE BOOKS:

1. C. Sujatha ... Dyer, S.A., Survey of Instrumentation and Measurement, John Wiley & Sons,Canada, 2001.
2. Hans Kurt Tönshoff (Editor), Ichiro, "Sensors in Manufacturing" Volume 1, Wiley-VCH April2001.
3. John Turner and Martyn Hill, "Instrumentation for Engineers and Scientists", Oxford SciencePublications, 1999.
4. Patranabis D, "Sensors and Transducers", 2^{nd} Edition, PHI, New Delhi, 2011.

COs	**POs**												**PSOs**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
1	3	2	1	2	2	1	-	-	-	-	-	1	2	1	3
2	3	2	1	2	2	1	-	-	-	-	-	1	2	1	3
3	3	2	1	1	2	1	-	-	-	-	-	1	2	1	3
4	3	2	1	3	2	1	-	-	-	-	-	1	2	1	3
5	3	2	1	3	2	1	-	-	-	-	-	1	2	1	3
Overall Corelation	3	2	1	2	2	1	-	-	-	-	-	1	2	1	3

23MT403 FLUID MECHANICS AND THERMAL SYSTEMS

	L	T	P	C
	3	0	0	3

COURSE OBJECTIVES:

- To knowledge in Fluid Properties and Statics.
- To understand the concept of fluid kinematics and Dynamics.
- To learn about the flows in fluid, Viscous flows and flow through pipes.
- To understand the basics laws of thermodynamics.
- To understand the second law of thermodynamics and entropy.

UNIT I FLUID PROPERTIES AND FLUID STATICS 9

Fluid Definition and Classification – Properties of fluids: Density, Specific Weight, Specific Volume, Specific Gravity, Viscosity, Compressibility, Bulk Modulus, Capillary and Surface Tension – Fluid statics: Concept of fluid static pressure – Pascal's law – Absolute and Gauge pressures – Manometers: Types and Pressure measurement.

UNIT II FLUID KINEMATICS AND FLUID DYNAMICS 9

Fluid Kinematics: Types of fluid flow – Continuity equation in two and three dimensions – Velocity and Acceleration of fluid particle Fluid dynamics: Euler's equation along a streamline –Bernoulli's equation and applications – Venturi meter, Orifice meter and Pitot tube.

UNIT III VISCOUS FLOW, FLOW THROUGH PIPES AND DIMENSIONAL ANALYSIS 9

Viscous flow: Shear stress, pressure gradient relationship – Flow of viscous fluid through circular pipe – Flow through pipes: Loss of head due to friction – Minor head losses – Hydraulic gradient and Total energy lines – Flow through pipes in series and in parallel – Dimensional analysis: Buckingham's theorem.

UNIT IV BASICS OF THERMODYNAMICS AND FIRST LAW OF THERMODYNAMICS 9

Thermodynamics – Microscopic and macroscopic point of view – Systems, properties, process, path, cycle. Thermodynamic equilibrium – Zeroth law of Thermodynamics – internal energy, enthalpy, specific heat capacities CV and CP, Relationship between CV and CP. First law of Thermodynamics – Application to closed and open systems – Steady Flow Energy Equation (SFEE) – Simple problems.

UNIT V SECOND LAW OF THERMODYNAMICS AND ENTROPY 9

Second Law of thermodynamics – Kelvin Planck and Clausius Statements – Equivalents of Kelvin Planck and Clausius statements. reversible cycle – Heat engine, heat pump and refrigerator. Carnot cycle, the property of entropy, the inequality of Clausius – Entropy principle – General expression for entropy – Simple problems in entropy.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

At the end of the course the students will be able to

CO1: Recognize the fluid properties, fluid statics and laws of thermodynamics.

CO2: Interpret the problems related to kinematics and dynamics of fluids and thermal systems.

CO3: Review the energy losses in flow through pipes and steady flow equation in thermal systems.

CO4: Analyse the fluid flow and thermal process.

CO5: Solve the problems related to fluid and thermal systems.

TEXT BOOKS:

1. Bansal R.K., ―Fluid Mechanics and Hydraulic Machines‖, 9th Edition, Laxmi Publications, New Delhi, 2015.
2. Nag P.K., ―Engineering Thermodynamics‖, 5th Edition, Tata McGraw Hill Publishing Company, New Delhi, 2013.

REFERENCE BOOKS:

1. C.S.P. Ojha, P.N. Chandramouli, and R. Berndtson “Fluid Mechanics and Machinery”, Oxford University Press, 2010.
2. C.P. Kothandaram, and R. Rudramoorthy, “ Fluid Mechanics and Machiery”, New Academic Science, 2011.
3. Cengel Yunus A. and Boles Michael A., ―Thermodynamics: An Engineering Approach‖,7th Edition, McGraw-Hill, New York, 2011.
4. Frank M. White., ―Fluid Mechanics‖, 7th Edition, Tata McGraw Hill Publishing Company, New Delhi, 2009.

COs	**POs**												**PSOs**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
1	3	3	2	-	1	-	-	-	-	-	1	1	2	2	1
2	3	3	2	-	1	-	-	-	-	-	1	1	2	2	1
3	2	2	3	2	2	3	-	-	-	-	1	1	3	3	1
4	2	2	3	2	1	2	-	-	-	-	1	1	3	3	1
5	3	3	2	2	2	2	-	-	-	-	1	1	2	2	1
Overall Correlation	3	3	2	2	1	2	-	-	-	-	1	1	2	2	1

23CE412	STRENGTH OF MATERIALS	L	T	P	C
		3	0	2	4

COURSE OBJECTIVES:

- To understand the concepts of stress, strain, principal stresses and principal planes.
- To study the concept of shearing force and bending moment due to external loads in determinate beams and their effect on stresses.
- To determine stresses and deformation in circular shafts and helical spring due to torsion.
- To compute slopes and deflections in determinate beams by various methods.
- To study the stresses and deformations induced in thin and thick shells.

UNIT I STRESS, STRAIN AND DEFORMATION OF SOLIDS 9+6

Rigid bodies and deformable solids – Tension, Compression and Shear Stresses – Deformation of simple and compound bars – Thermal stresses – Elastic constants, Poisson's ratio – Volumetric strains – Stresses on inclined planes – principal stresses and principal planes – Mohr's circle for plane stress.

UNIT II TRANSVERSE LOADING ON BEAMS AND STRESSES IN BEAMS 9+6

Beams – types transverse loading on beams – Shear force and bending moment in beams – Cantilevers – Simply supported beams and over – hanging beams. Theory of simple bending– bending stress distribution – Load carrying capacity – Proportioning of sections– Shear stress distribution.

UNIT III DEFLECTION OF BEAMS 9+6

Double Integration method – Macaulay's method – Area moment method- Conjugate beam method for computation of slopes and deflections in determinate beams.

UNIT IV TORSION, SPRINGS AND COLUMNS 9+6

Theory of Torsion - Stresses and deformations in solid and hollow circular shafts – Stepped shafts – Power transmitted by a shaft.
Helical springs – Differences between closely coiled and open coiled helical springs – Closely coiled helical springs – Calculation of shear stress, deflection and stiffness.
Columns – Euler's theory – Calculation of crippling load for different end conditions for a long column.

UNIT V THIN CYLINDERS, SPHERES AND THICK CYLINDERS 9

Stresses in thin and thick cylindrical shell, deformation in thin and thick cylinders – spherical shells subjected to internal pressure –Deformation in spherical shells.

LIST OF EXPERIMENTS

1. Tension test on mild steel rod
2. Double shear test on mild steel rod
3. Torsion test on mild steel rod
4. Izod Impact test on metal specimen
5. Charpy Impact test on metal specimen
6. Rockwell Hardness test on metals
7. Brinell Hardness test on metals
8. Compression test on helical spring.
9. Heat Treatment Processes- Annealing, Normalizing, Quenching and Tempering
10. Jominy End Quench Test

TOTAL: 45 + 30 PERIODS

COURSE OUTCOMES:

At the end of the course the students will be able to

CO1: Calculate the different stresses developed in the solids when subjected to different loading conditions.

CO2: Interpret the shear force and bending moment diagrams of the beams under the various loading conditions.

CO3: Examine the bending stress and shear stress distribution of various sections of the beam.

CO4: Calculate the slope and deflection of beams using different methods.

CO5: Apply the basic equations to design shafts, springs and columns.

CO6: Calculate the stresses developed in the thin cylinder, thick cylinder, and spherical shells.

TEXT BOOKS:

1. Bansal, R.K., "Strength of Materials", Laxmi Publications (P) Ltd., 2016
2. Rattan S.S., “Strength of Materials", Tata McGraw Hill Education Pvt. Ltd., New Delhi, 2017.

REFERENCE BOOKS:

1. Rajput R.K. “Strength of Materials (Mechanics of Solids)", S.Chand & company Ltd., New Delhi, 7th edition, 2018.
2. Egor P Popov, “Engineering Mechanics of Solids”, 2nd edition, PHI Learning Pvt. Ltd., New Delhi, 2015.
3. Beer. F.P. & Johnston. E.R. “Mechanics of Materials”, Tata McGraw Hill, 8th Edition, New Delhi 2019.

4. Subramanian R., "Strength of Materials", Oxford University Press, Oxford Higher Education Series, 2010.

COs	POs												PSOs		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
1	3	2	1	1	1	1	-	-	2	-	-	-	3	1	-
2	3	2	1	1	1	1	-	-	2	-	-	-	3	1	-
3	3	2	1	1	1	1	-	-	2	-	-	-	3	1	-
4	3	2	1	1	1	1	-	-	2	-	-	-	3	1	-
5	3	2	1	1	1	1	-	-	2	-	-	-	3	1	-
6	3	2	1	1	1	1	-	-	2	-	-	-	3	1	-
Overall correlation	3	2	1	1	1	1	-	-	2	-	-	-	3	1	-

23MT421 FLUID MECHANICS LABORATORY

L	T	P	C
0	0	4	2

COURSE OBJECTIVES:

- To verify the principles studied in Fluid Mechanics theory by performing experiments in lab.

List of Experiments

1. Determination of the Coefficient of discharge of given Orifice meter.
2. Determination of the Coefficient of discharge of given Venturi meter.
3. Calculation of the rate of flow using Rota meter.
4. Determination of friction factor for a given set of pipes.
5. Conducting experiments and drawing the characteristic curves of centrifugal pump.
6. Conducting experiments and drawing the characteristic curves of reciprocating pump.
7. Conducting experiments and drawing the characteristic curves of Gear pump.
8. Conducting experiments and drawing the characteristic curves of Pelton wheel.

OUTCOMES:

Upon completion of this course, the students will be able to:

- Perform Tension, Torsion, Hardness, Compression, and Deformation test on Solid materials.
- Use the measurement equipment for flow measurement.
- Perform test on different fluid machinery.

COs	POs												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	3	3	2	1	1	1	-	-	-	-	1	1	2	2	1
2	3	3	2	1	1	1	-	-	-	-	1	1	2	2	1
3	2	2	3	2	2	3	-	-	-	-	1	1	3	3	1
4	2	2	3	2	1	2	-	-	-	-	1	1	3	3	1
5	3	3	2	2	2	2	-	-	-	-	1	1	2	2	1
Overall Correlation	3	3	2	2	1	2	-	-	-	-	1	1	2	2	1

23MT422	SENSORS AND INSTRUMENTATION LABORATORY	L	T	P	C
		0	0	4	2

COURSE OBJECTIVES:

- To learn about various force, pressure and vibration measuring sensors.
- To learn about various Temperature, light and magnetic field measuring sensors.
- To learn about various displacement and speed measuring sensors.

LIST OF EXPERIMENTS :

1. Determination of Load, Torque and Force using Strain Gauge.
2. Determination of the characteristics of Pressure Sensor and Piezoelectric Force Sensor.
3. Determination of Displacement using LVDT.
4. Determine the Characteristics of Various Temperature Sensors.
5. Determine the Characteristics of Various Light Detectors (Optical Sensors).
6. Distance Measurement using Ultrasonic and Laser Sensor.
7. Determine angular velocity of gyroscope.
8. Vibration measurement using Accelerometer.
9. Direction measurement using Magnetometer.
10. Speed, Position and Direction Measurement Using Encoders.
11. Force measurement using 3 axis force sensor.
12. Force Measurement using tactile sensors.
13. Data acquisition, visualization and analysis of signals.

TOTAL : 60 PERIODS

COURSE OUTCOMES:

At the end of the course the students will be able to

CO1: Demonstrate the various contact and non-contact sensors.

CO2: Analyze and Identify appropriate sensors for given applications.

CO3: Create a sensor system for given requirements.

COs	POs												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	3	2	1	1	2	1	-	-	-	-	-	1	2	1	3
2	3	2	1	1	2	1	-	-	-	-	-	1	2	1	3
3	3	2	1	1	2	1	-	-	-	-	-	1	2	1	3
Overall Correlation	3	2	1	1	2	1	-	-	-	-	-	1	2	1	3

23ES491 APTITUDE AND LOGICAL REASONING –I

	L	T	P	C
	0	0	2	1

COURSE OBJECTIVES:

- To improve the problem solving and logical thinking ability of the students.
- To acquaint student with frequently asked questions and patterns in quantitative aptitude and logical reasoning.

UNIT I **4**

Numbers, LCM, HCF, Averages, Ratio & Proportion, Mixtures & Allegation.

UNIT II **4**

Percentages, Time and work, Pipes and Cistern, coding and decoding.

UNIT III **4**

Time Speed Distance, Train, Boats and Streams, Analogy.

UNIT IV **4**

Data Interpretation(BAR,PIE,LINE), Seating arrangement.

UNIT V **4**

Simple Interest and Compound Interest, Profit loss and Discount, Partnership.

TOTAL: 20 PERIODS

COURSE OUTCOMES:

At the end of the course the students will be able to

CO 1 Understand the basic concepts of quantitative ability.

CO 2 Understand the basic concepts of logical reasoning Skills.

CO 3 Increase in critical thinking skills.

CO 4 Able to solve campus placements aptitude papers covering Quantitative Ability, Logical Reasoning Ability.

TEXT BOOK:

APTIPEDIA, 2nd edition, Wiley Publishers.

REFERENCE BOOKS:

1. Quantitative Aptitude – R.S. Agarwal.
2. A Modern Approach To Verbal & Non-Verbal Reasoning By R S Agarwal.