KCG

COLLEGE OF TECHNOLOGY

AFFILIATED TO ANNA UNIVERSITY | AUTONOMOUS

REGULATIONS - 2023

CURRICULUM AND SYLLABI

(2023-2024)

B.E COMPUTER SCIENCE AND ENGINEERING - ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING

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KCG COLLEGE OF TECHNOLOGY
AUTONOMOUS
REGULATIONS 2023
B.E. COMPUTER SCIENCE ENGINEERING – (ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING)
CHOICE BASED CREDIT SYSTEM
CURRICULUM 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	23AM101	Programming in C and C++	ESC	3	1	0	4	4
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	23AM121	Programming in C and C++ 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	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	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	23MA202	Discrete Mathematics	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	PCC	0	0	4	4	2
9	23IT221	Data Structures and Algorithms Laboratory	PCC	0	0	4	4	2
10	23HS221	Soft Skills	EEC	0	0	2	2	1*
TOTAL				18	1	14	33	25

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SEMESTER-III

Sl. No.	Course code	Course Title	Category	Periods Per Week			Total Contact Periods	Credits
				L	T	P		
THEORY								
1	23MA204	Probability and Statistics	BSC	3	1	0	4	4
2	23CS302	Database Management Systems	PCC	3	0	0	3	3
3	23AM301	Python Programming for AI&ML	PCC	3	0	0	3	3
4	23HS301	Universal Human Values and Ethics	HSMC	3	0	0	3	3
THEORY AND PRACTICALS								
5	23AM311	Artificial Intelligence Essentials	PCC	3	0	2	5	4
6	23AM312	Data Warehousing and Knowledge Discovery	PCC	3	0	2	5	4
PRACTICALS								
7	23CS322	Database Management Systems Laboratory	PCC	0	0	4	4	2
8	23AM321	Python Programming for AI&ML Lab	PCC	0	0	4	4	2
9	23ES391	Presentation Skills	EEC	0	0	2	2	1*
TOTAL				18	1	14	33	25

*** 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-IV

Sl. No.	Course code	Course Title	Category	Periods Per Week			Total Contact Periods	Credits
				L	T	P		
THEORY								
1	23AM401	Foundation of Software Engineering	PCC	3	0	0	3	3
2	23AM402	Object Oriented Programming using Java	PCC	3	0	0	3	3
3	23AM403	Principles and Practices of Machine Learning	PCC	3	0	0	3	3
THEORY AND PRACTICALS								
4	23AM411	Operating Systems Principles		3	0	2	5	4
5	23AM412	Automata Theory and Compiler Engineering	PCC	3	0	2	5	4
6	23AM413	Big Data Computing and Tools	BSC	3	0	2	4	3
PRACTICALS								
7	23AM421	Principles and Practices of Machine Learning Laboratory	PCC	0	0	4	4	2
8	23AM422	Object Oriented Programming using Java Laboratory	PCC	0	0	4	4	2
9	23ES491	Aptitude and Logical Reasoning - 1	EEC	0	0	2	2	1*
TOTAL				17	0	14	31	24

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SEMESTER-V

Sl. No.	Course Code	Course Title	Category	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	23AM501	Deep Learning Techniques	PCC	3	0	0	3	3
3		Department Elective 1	DEC	-	-	-	-	3
4		Department Elective 2	DEC	-	-	-	-	3
5		Open Elective – 1 (Emerging Technologies)	OEC	3	0	0	3	3
THEORY AND PRACTICALS								
6	23AM511	Computer Network Architecture and Protocols	PCC	3	0	2	5	4
PRACTICALS								
7	23AM521	Deep Learning Techniques Laboratory	PCC	0	0	4	4	2
8	23AM522	Mini Project	EEC	0	0	3	3	2
9	23AM523	Summer Internship	EEC	0	0	0	0	1
10	23ES591	Aptitude and Logical Reasoning-2	EEC	0	0	2	2	1*
TOTAL				-	-	-	-	23

*** 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 VI

Sl. No.	Course Code	Course Title	Category	Periods Per Week			Total Contact Periods	credits
				L	T	P		
THEORY								
1		Department Elective 3	DEC	-	-	-	-	3
2		Department Elective 4	DEC	-	-	-	-	3
3		Open Elective-2 (Management /Safety Courses)	OEC	3	0	0	3	3
THEORY AND PRACTICALS								
4	23CE611	Environmental Science and Engineering	ESC	3	0	2	5	4
5	23AM611	Statistical Natural Language Processing	PCC	3	0	2	5	4
6	23AM612	Visual Data Processing	PCC	3	0	2	5	4
PRACTICALS								
7	23AM621	Project Work - Phase 1	EEC	0	0	4	4	2
8	23AM622	Technical Training	EEC	0	0	2	2	1
9	23AM623	Technical Seminar– 1	ESC	0	0	2	2	1
TOTAL				-	-	-	-	25

SEMESTER -VII

Sl. No.	Course Code	Course Title	Category	Periods Per Week			Total Contact Periods	Credits
				L	T	P		
THEORY								
1		Open Elective-3 (Management Courses)	OEC	3	0	0	3	3
2		Department Elective	DEC	-	-	-	-	3
3		Department Elective	DEC	-	-	-	-	3
4	23AM701	Technical Comprehension	EEC	2	0	0	2	2
THEORY AND PRACTICALS								
5	23AD711	Generative AI	PCC	3	0	2	5	4
PRACTICALS								
6	23AM721	Project Work – Phase 2	EEC	0	0	6	6	3
7	23AM722	Technical Seminar - 2	ESC	0	0	4	4	2
TOTAL				-	-	-	-	20

SEMESTER -VIII

Sl. No	Course code	Course Title	Category	Periods Per Week			Total Contact Periods	Credits
				L	T	P		
PRACTICALS								
1	23AM821 /23AM822	Capstone Project / Internship cum project	EEC	0	0	20	20	10
TOTAL				0	0	20	20	10

TOTALCREDITS: 173

DEPARTMENT ELECTIVE COURSES: VERTICALS

VERTICAL 1: GENERIC COMPUTER ENGINEERING

Sl. No.	Course Code	Course Title	Category	Periods Per Week			Total Contact periods	Credits
				L	T	P		
1	23AM031	Digital Systems and Computer Organization	DEC	2	0	2	3	3
2	23AD032	Unified Modeling Language	DEC	2	0	2	4	3
3	23AD033	Web Essentials	DEC	2	0	2	4	3
4	23AM032	Distributed Computing	DEC	3	0	0	3	3
5	23AM033	AI in Wireless Communications	DEC	3	0	0	3	3
6	23AD036	Cryptography and Network Security	DEC	2	0	2	4	3
7	23AM034	Data Science in Practice	DEC	3	0	0	3	3
8	23AD038	Object Oriented Thinking in Software Design	DEC	3	0	0	3	3

VERTICAL 2 : ANALYTICAL SCIENCES

Sl. No.	Course Code	Course Title	Category	Periods Per Week			Total Contact periods	Credits
				L	T	P		
1	23AD039	Responsible AI	DEC	3	0	0	3	3
2	23AD040	Natural Language Processing	DEC	2	0	2	4	3
3	23AD041	Exploratory Data Analysis	DEC	2	0	2	4	3
4	23AM035	Nature Inspired Computing Methods	DEC	3	0	0	3	3
5	23AD043	Intelligent Robots	DEC	3	0	0	3	3
6	23AM036	Multimodal AI	DEC	3	0	0	3	3
7	23AD045	Data Exploration and Visualization	DEC	2	0	2	4	3
8	23AM037	Optimization Techniques for Machine Learning	DEC	3	0	0	3	3

VERTICAL 3

FULL STACK DEVELOPMENT

Sl. No.	Course Code	Course Title	Category	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	23CS038	Python Full Stack Development with Machine Learning (Industry Supported Course)	DEC	2	0	2	4	3
7	23AD047	Software Design Thinking	DEC	3	0	0	3	3
8	23CS044	Explainable AI	DEC	3	0	0	4	3

VERTICAL 4

COMPUTATIONAL INTELLIGENCE

Sl. No.	Course Code	Course Title	Category	Periods Per Week			Total Contact Periods	Credits
				L	T	P		
1	23AM039	Embedded AI	DEC	3	0	0	3	3
2	23AD049	Immersive Technologies	DEC	2	0	2	4	3
3	23AD050	Ethics of AI	DEC	2	0	2	4	3
4	23AM040	Kernel Methods for Pattern Analysis	DEC	2	0	2	4	3
5	23AM041	MLOps	DEC	3	0	0	3	3
6	23AD053	Computer Vision	DEC	2	0	2	4	3
7	23CB058	Cryptocurrency	DEC	2	0	2	3	3
8	23CS041	Game Development	DEC	2	0	2	4	3

VERTICAL 5

CYBER SECURITY AND CLOUD COMPUTING

Sl. No.	Course code	Course Title	Category	Periods Per Week			Total Contact periods	Credits
				L	T	P		
1	23AD054	Web Security	DEC	2	0	2	4	3
2	23AD055	AI for Cyber Security	DEC	2	0	2	4	3
3	23AD056	Cyber Threat Intelligence	DEC	3	0	0	3	3
4	23AM042	AI for Inter-Disciplinary Applications	DEC	3	0	0	3	3
5	23AD058	Steganography and Digital Watermarking	DEC	2	0	2	4	3
6	23AD059	Utility Computing	DEC	2	0	2	3	3
7	23AD060	Cloud Databases	DEC	2	0	2	4	3
8	23AM043	Robotic Process Automation	DEC	2	0	2	3	3

OPEN ELECTIVE – EMERGING TECHNOLOGIES

Sl. No.	Course code	Course title	Category	Periods per week			Total contact periods	Credits
				L	T	P		
1	23OE982	Resource Management Techniques	OEC	3	0	0	3	3
2	23OE983	Aviation Management	OEC	3	0	0	3	3
3	23OE986	Foundation of Robotics	OEC	3	0	0	3	3
4	23OE987	Space Engineering	OEC	3	0	0	3	3
5	23OE988	Fundamentals of Electric and Hybrid Vehicles	OEC	3	0	0	3	3
6	23OE989	Fundamentals of Wearable Devices	OEC	3	0	0	3	3

OPEN ELECTIVE – MANAGEMENT COURSES

Sl. No.	Course Code	Course Title	Category	Periods Per Week			Total Contact Periods	Credits
				L	T	P		
1	23OMG971	Total Quality Management	OEC	3	0	0	3	3
2	23OMG972	Engineering Economics and Financial Accounting	OEC	3	0	0	3	3
3	23OMG973	Engineering Management and Law	OEC	3	0	0	3	3
4	23OMG974	Knowledge Management	OEC	3	0	0	3	3
5	23OMG975	Industrial Management	OEC	3	0	0	3	3
6	23OMG976	Entrepreneurship and Business Opportunities	OEC	3	0	0	3	3
7	23OMG977	Modern Business Administration and Financing	OEC	3	0	0	3	3
8	23OMG978	Essentials of Management	OEC	3	0	0	3	3

OPEN ELECTIVE – SAFETY RELATED COURSES

Sl. No.	Course Code	Course Title	Category	Periods Per Week			Total Contact Periods	Credits
				L	T	P		
1	23OAU981	Automotive Safety	OEC	3	0	0	3	3
2	23OCE981	Disaster Management	OEC	3	0	0	3	3
3	23OME981	Industrial Safety	OEC	3	0	0	3	3

SEMESTER-WISE CREDIT DISTRIBUTION

SEMESTER	HSMC	BSC	ESC	PCC	DEC	OEC	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				24
Semester V			2	9	6	3	3	23
Semester VI			5	8	6	3	3	25
Semester VII			2	4	6	3	5	20
Semester VIII							10	10
Total	**12**	**26**	**23**	**64**	**18**	**9**	**21**	**173**

SEMESTER –I

23IP101	INDUCTION PROGRAMME	L	T	P	C
		-	-	-	0

COURSE OBJECTIVES:

- This is a mandatory 2 weeks Programme to be conducted as soon as the students enter the institution. Normal classes start only after the induction program is over.
- The induction Programme has been introduced by AICTE with the following objectives
- Engineering colleges were established to train graduates well in the branch/department of admission, have a holistic outlook, and have a desire to work for national needs and beyond. The graduating student must have knowledge and skills in the area of his/her study. However, he/she must also have broad understanding of society and relationships. Character needs to be nurtured as an essential quality by which he/she would understand and fulfill his/her responsibility as an engineer, a citizen and a human being. Besides the above, several meta-skills and underlying values are needed.
- One will have to work closely with the newly joined students in making them feel comfortable, allow them to explore their academic interests and activities, reduce competition and make them work for excellence, promote bonding within them, build relations between teachers and students, give a broader view of life, and build character
- Hence, the purpose of this Programme is to make the students feel comfortable in their new environment, open them up, set a healthy daily routine, create bonding in the batch as well as between faculty and

students, develop awareness, sensitivity and understanding of the self, people around them, society at large, and nature • **Physical Activity** This would involve a daily routine of physical activity with games and sports, yoga, gardening, etc., • **Life skills** Every student would choose one skill related to daily needs such as stitching, accounting, finance management, etc.,
Universal human values
This is the anchoring activity of the Induction Programme. It gets the student to explore oneself and allows one to experience the joy of learning, stand up to peer pressure, take decisions with courage, be aware of relationships with colleagues and supporting stay in the hostel and department, be sensitive to others, etc. A module in Universal Human Values provides the base. Methodology of teaching this content is extremely important. It must not be through dos and don'ts, but get students to explore and think by engaging them in a dialogue. It is best taught through group discussions and real-life activities rather than lecturing.
Club Activity
Students will be introduced to more than 20 Clubs available in the college-both technical and non-technical. The student can choose as to which club the student will enroll in.
Value Based Communication
This module will focus on improving the communication skills of students
Lectures by Alumni
Lectures by alumni are arranged to bring in a sense of belonging to the student towards the institution and also to inspire them to perform better
Visits to Local Area

A couple of visits to the landmarks of the city, or a hospital or orphanage could be organized. This would familiarize them with the area as well as expose them to the under privileged
Familiarization to Dept./Branch & Innovations
They should be told about what getting into a branch or department means what role it plays in society, through its technology. They should also be shown the laboratories, workshops & other facilities
Address by different heads
Heads of Placement, Training, Student affairs, counsellor, etc would be interacting with the students to introduce them to various measures taken in the institution for the betterment of students.
Induction Programme is totally an activity-based Programme and therefore there shall be no tests / assessments during this Programme.
REFERENCES:
Guide to Induction program from AICTE

23HS101	ESSENTIAL COMMUNICATION	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To help learners extract information from short and simple correspondence
- To familiarize learners with different text structures by engaging them in reading, writing and grammar learning activities
- To help learners write coherent, short paragraphs and essays
- To enable learners to use language efficiently while expressing their opinions via various media.

UNIT I	FORMATION OF SENTENCES	9

Reading- Read pictures-notices- short comprehension passages and recognize main ideas and specific details. Writing- framing simple and compound sentences, completing sentences, developing hints, writing text messages. Language development- Parts of Speech, Wh- Questions, yes or no questions, direct and indirect questions. Vocabulary development– prefixes- suffixes- articles – countable and uncountable nouns

UNIT II	NARRATION AND DESCRIPTION	9

Reading – Read short narratives and descriptions from newspapers, dialogues and conversations. Reading strategies and practices. Language development – Tenses- simple present, present continuous, present perfect, simple past, past continuous, past perfect, simple future, future continuous, past participle, pronouns. Vocabulary development- guessing meanings of words in context. Writing – Write short narrative paragraphs, biographies of friends/relatives - writing- topic sentence- main ideas- free writing, short narrative descriptions using some suggested vocabulary and structures.

UNIT III	COMPARING AND CONTRASTING	9
Reading- short texts and long texts -understanding different types of text structures, -coherence-jumbled sentences. Language development- degrees of comparison, concord- Vocabulary development – single word substitutes- discourse markers- use of reference words Writing - comparative and contrast paragraphs writing- topic sentence- main idea, free writing, compare and contrast using some suggested vocabulary and structures.		
UNIT IV	**SOCIAL MEDIA COMMUNICATION**	**9**
Reading- Reading blogs, social media reviews, posts, comments, process description, Language development - relative clause, Vocabulary development- social media terms-words, abbreviations and acronyms Writing- -e-mail writing-conventions of personal email, descriptions for simple processes, critical online reviews, blog, website posts, commenting to posts.		
UNIT V	**ESSAY WRITING**	**9**
Reading- Close reading non-technical longer texts Language development - modal verbs, phrasal verbs- Vocabulary development - collocation. Writing- Writing short essays- brainstorming – developing an outline- identifying main and subordinate ideas.		
TOTAL: 45 PERIODS		
COURSE OUTCOMES:		
After completion of the course, the students will be able to:		
CO1:	Summarize simple, level-appropriate texts of around 300 words recognizing main ideas and specific details.	
CO2:	Demonstrate the understanding of more complex grammatical structures and diction while reading and writing.	

CO3:	Use appropriate expressions to describe, compare and contrast people, things, situations etc., in writing.
CO4:	Establish the ability to communicate effectively through emails.
CO5:	Determine the language use appropriate for different social media platforms.
CO6:	Use appropriate expressions for narrative descriptions and process descriptions.
TEXT BOOKS:	
1	Susan Proctor, Jack C. Richards, Jonathan Hull. Interchange Level 2. Cambridge University Press and Assessment
2	Susan Proctor, Jack C. Richards, Jonathan Hull. Interchange Level 3. Cambridge University Press and Assessment
REFERENCES:	
1	Dutt P. Kiranmai and Rajeevan Geeta. Basic Communication Skills, Foundation Books: 2013
2	Means,L. Thomas and Elaine Langlois. English & Communication for Colleges. Cengage Learning , USA: 2007

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	-	-	-	-	-	-	-	-	2	3	-	2	-	-	-
3	-	-	-	-	-	1	1	-	2	3	-	2	-	-	-
4	-	-	-	-	-	-	-	-	-	3	-	2	-	-	-
5	-	-	-	-	-	1	1	-	3	3	-	2	-	-	-
6	-	-	-	-	-	1	1	-	3	3	-	2	-	-	-
Overall Correlation	-	-	-	-	-	**1**	**1**	-	**3**	**3**	-	**2**	-	-	-

Recommended by Board of Studies	**28-07-2023**		
Approved	**1st ACM**	**Date**	**09-09-2023**

23MA101	MATRICES AND CALCULUS	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To develop the use of matrix algebra techniques that is needed by engineers for practical applications.
- To familiarize the students with differential calculus.
- To familiarize the student with functions of several variables. This is needed in many branches of engineering.
- To make the students understand various techniques of integration.
- To acquaint the student with mathematical tools needed in evaluating multiple integrals and their applications

UNIT I	MATRICES	9

Eigenvalues and Eigenvectors of a real matrix – Characteristic equation – Properties of Eigenvalues and Eigenvectors – Cayley - Hamilton theorem – Diagonalization of matrices by orthogonal transformation – Reduction of a quadratic form to canonical form by orthogonal transformation – Nature of quadratic forms – Applications: Stretching of an elastic membrane.

UNIT II	DIFFERENTIAL CALCULUS	9

Representation of functions - Limit of a function - Continuity - Derivatives - Differentiation rules (sum, product, quotient, chain rules) - Implicit differentiation - Logarithmic differentiation - Applications : Maxima and Minima of functions of one variable.

UNIT III	FUNCTIONS OF SEVERAL VARIABLES	9

Partial differentiation – Homogeneous functions and Euler's theorem – Total derivative – Change of variables – Jacobians – Partial differentiation of implicit functions – Taylor's series for functions of two variables – Applications: Maxima and minima of functions of two variables and Lagrange's method of undetermined multiplier.

UNIT IV	INTEGRAL CALCULUS	9

Definite and Indefinite integrals - Substitution rule - Techniques of

Integration: Integration by parts, Trigonometric integrals, Trigonometric substitutions, Integration of rational functions by partial fraction, Integration of irrational functions - Improper integrals.		
UNIT V	**MULTIPLE INTEGRALS**	**9**
Double integrals – Change of order of integration – Double integrals in polar coordinates – Area enclosed by plane curves – Triple integrals – Volume of solids – Change of variables in double and triple integrals.		
		TOTAL: 45 PERIODS

COURSE OUTCOMES:	
After completion of the course, the students will be able to:	
CO1:	Apply the matrix algebra techniques and applications in Engineering Problems.
CO2:	Make use of the concept of limits and rules of differentiation to differentiate functions
CO3:	Find the derivative of functions of several variables
CO4:	Examine the application of partial derivatives
CO5:	Compute integrals by different techniques of Integration.
CO6:	Apply the concept of integration to compute multiple integrals.
TEXT BOOKS:	
1	Kreyszig. E, "Advanced Engineering Mathematics", John Wiley and Sons, 10th Edition, New Delhi, 2016.
2	James Stewart, "Calculus: Early Transcendentals", Cengage Learning, 8th Edition, New Delhi, 2015.
REFERENCES:	
1	Dr.P.Sivaramakrishnadas, Dr.C.Vijayakumari., — Matrices and Calculus‖ Pearson Publications Andrews. L.C and Shivamoggi. B, "Integral Transforms for Engineers" SPIE Press, 1999.
2	Anton. H, Bivens. I and Davis. S, " Calculus ", Wiley, 10th Edition, 2016

3	Bali. N., Goyal. M. and Watkins. C., ―Advanced Engineering Mathematics‖, Firewall Media (An imprint of Lakshmi Publications Pvt., Ltd.,), New Delhi, 7th Edition, 2009.
4	Narayanan. S. and Manicavachagom Pillai.T. K., ―Calculus" Volume I and II, S. Viswanathan Publishers Pvt. Ltd., Chennai, 2009.

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	-	-
6	3	2	1	1	-	-	-	-	-	-	-	1	3	-	-
Overall Correlation	3	2	1	1	-	-	-	-	-	-	-	1	3	-	-

Recommended by Board of Studies	**02-08-2023**		
Approved	**1st ACM**	**Date**	**09-09-2023**

23AM101	PROGRAMMING IN C AND C++	L	T	P	C
		3	1	0	4

COURSE OBJECTIVES:

- To familiarize with C programming constructs.
- To know about the essence of programing.
- To study programs in C using arrays, strings and Pointers
- To learn programs in C++ using class and objects.
- To understand applications in C++ using operator overloading.
- To study applications in C using inheritance and polymorphism.

UNIT I	INTRODUCTION TO PROGRAMMING LANGUAGE	9+3

Introduction to programming language paradigms – Problem solving methods-Flowcharts and Algorithms, Introduction to C-Structure of C, Compilation and Execution, C-character set, identifiers & Keywords, variables and constants, data types, expressions, operators in C, Input and output statements in C.

UNIT II	ESSENCE OF C PROGRAMMING	9+3

Control structures – Decision making and branching, looping structures, switch-case, break and continue, goto statement, functions – advantages, storage classes, creating user-defined functions, recursion, Parameter passing, arrays- types of arrays, arrays and functions.- Introduction to pointers-pointer declaration, pointer operators, Dynamic memory allocation.

UNIT III	OBJECT ORIENTED PROGRAMMING	9+3

Introduction to object-oriented programming – Difference between function-oriented programming and object-oriented programming, Features of OOP, Applications of OOP, structure of C++ program with simple C++ program, basics of console Input and Output, C++ data types, Operators in C++, Control Structures, Functions-inline functions, default arguments, function overloading.

UNIT IV	CLASSES AND OBJECTS	9+3
Classes and Objects: Specifying a class, defining member functions, Access control, constructors and destructors, Friend functions – Inheritance – Class hierarchy, derived classes, types of inheritance, Polymorphism-static binding, dynamic binding, method overloading with virtual functions, pure virtual functions, abstract classes		
UNIT V	**OPERATOR OVERLOADING**	**9+3**
Operator overloading-this pointer, applications of this pointer, operator function, operator overloading. Exception handling- Try, throw and catch, Dynamic Memory management, new and delete operators, object copying, copy constructor.		
		TOTAL: 60 PERIODS

COURSE OUTCOMES:	
After completion of the course, the students will be able to:	
CO1:	To familiarize with C programming constructs.
CO2:	To develop programs in C using basic constructs.
CO3:	To develop programs in C using arrays, strings and Pointers
CO4:	To develop programs in C++ using class and objects.
CO5:	To develop applications in C++ using operator overloading.
CO6:	To develop applications in C using inheritance and polymorphism.

TEXT BOOKS:	
1	Programming in C by E.Balaguruswamy, McGrawhill 6th Edition.
2	Object oriented Programming with C++ by E.Balaguruswamy McGrawHill Education.

REFERENCES:	
1	ReemaThareja, "Programming in C", Oxford University Press, Second Edition, 2016.
2	The C++ Programming Language" (4th Edition) by Bjarne Stroustrup

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	1	-
2	3	2	1	1	1	-	-	-	-	-	-	1	3	1	-
3	3	2	1	1	1	-	-	-	-	-	-	1	3	1	-
4	3	2	1	1	1	-	-	-	-	-	-	1	3	1	-
5	3	2	1	1	1	-	-	-	-	-	-	1	3	1	-
6	3	2	1	1	1	-	-	1	1	1	1	1	3	1	1
Overall Correlation	**3**	**2**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**3**	**1**	**1**
Recommended by Board of Studies							**28-07-2023**								
Approved							**1st ACM**			**Date**			**09-09-2023**		

23HS102	HERITAGE OF TAMILS	L	T	P	C
		1	0	0	1

COURSE OBJECTIVES:

- Explain the classical literature of Tamil and highlight notable Tamil poets.
- Explain the creation of traditional Tamil musical instruments.
- Explain the sports and games associated with Tamil heritage.
- Explore the education and literacy practices during the Sangam period.
- Explain the contributions of Tamils to the Indian freedom struggle.
- Explain the development and history of printing in Tamil Nadu.

UNIT I	LANGUAGE AND LITERATURE	3

Language Families in India – Dravidian Languages – Tamil as a Classical Language – Classical Literature in Tamil – Secular Nature of Sangam Literature – Distributive Justice in Sangam Literature – Management Principles in Thirukural – Tamil Epics and Impact of Buddhism & Jainism in Tamil Land – Bakthi Literature Azhwars and Nayanmars – Forms of minor Poetry – Development of Modern literature in Tamil – Contribution of Bharathiyar and Bharathidhasan.

UNIT II	HERITAGE – ROCK ART PAINTINGS TO MODERN ART – SCULPTURE	3

Hero stone to modern sculpture – Bronze icons – Tribes and their handicrafts – Art of temple car making – – Massive Terracotta sculptures, Village deities, Thiruvalluvar Statue at Kanyakumari, Making of musical instruments – Mridhangam, Parai, Veenai, Yazh and Nadhaswaram – Role of Temples in Social and Economic Life of Tamils.

UNIT III	**FOLK AND MARTIAL ARTS**	**3**
Therukoothu, Karagattam, Villu Pattu, Kaniyan Koothu, Oyillattam, Leatherpuppetry, Silambattam, Valari, Tiger dance – Sports and Games of Tamils.		
UNIT IV	**THINAI CONCEPT OF TAMILS**	**3**
Flora and Fauna of Tamils & Aham and Puram Concept from Tholkappiyam and Sangam Literature – Aram Concept of Tamils – Education and Literacy during Sangam Age – Ancient Cities and Ports of Sangam Age – Export and Import during Sangam Age – Overseas Conquest of Cholas		
UNIT V	**CONTRIBUTION OF TAMILS TO INDIAN NATIONAL MOVEMENT AND INDIAN CULTURE**	**3**
Contribution of Tamils to Indian Freedom Struggle – The Cultural Influence of Tamils over the other parts of India – Self-Respect Movement – Role of Siddha Medicine in Indigenous Systems of Medicine – Inscriptions & Manuscripts – Print History of Tamil Books.		
		TOTAL: 15 PERIODS

COURSE OUTCOMES:	
After completion of the course, the students will be able to:	
CO1:	Explain the evolution of Tamil language and literature, focusing on its cultural, ethical, and secular themes.
CO2:	Outline the making of musical instruments related to Tamil heritage.
CO3:	Discuss the sports and games of Tamils
CO4:	Explain the education and literacy during Sangam age.
CO5:	Express the importance and contribution of Tamils to Indian Freedom Struggle
CO6:	Outline the print history of books in Tamil Nadu

TEXT BOOKS:	
1	தமிழ்நாடு பாடநூல் மற்றும் கல்வியியல் பணிகள் கழகம்). தமிழக வரலாறு-மக்களும் பண்பாடும்-கே.கேபிள்ளை (வெளியீடு:
2	கணினித்தமிழ் – முனைவர் இல. சுந்தரம் (விகடன் பிரசுரம்).
REFERENCES:	
1	**கீழடி- வைகை நதிக்கரையில் சங்க கால நகர நாகரிகம் (தொல்லியல் துறை வெளியீடு)**
2	பொருனை- ஆற்றங்கரை **நாகரிகம் (தொல்லியல் துறை வெளியீடு)**

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

Recommended by Board of Studies	28-07-2023		
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23PH111	ENGINEERING PHYSICS	L	T	P	C
		3	0	2	4

COURSE OBJECTIVES:

- To make the students effectively achieve an understanding of mechanics.
- To enable the students to gain knowledge of electromagnetic waves and its applications.
- To introduce the basics of optics and lasers.
- To equip the students successfully understand the importance of quantum physics.
- To motivate the students towards the applications of quantum mechanics.

UNIT I	MECHANICS	9

Types of stress, Stress-strain diagram and its uses- factors affecting elastic modulus- tensile strength- Bending of beams, bending moment – theory and experiment: Uniform and non-uniform bending, Center of mass (CM) – CM of continuous bodies –rod, motion of the CM. Rotation of rigid bodies: Rotational kinematics – rotational kinetic energy and moment of inertia - theorems of M .I –moment of inertia of rod, disc, solid sphere – M.I of a diatomic molecule - torque -rotational energy state of a rigid diatomic molecule – M.I of disc by torsional pendulum

UNIT II	ELECTROMAGNETIC WAVES	9

Concept of field-introduction to gradient, divergence and curl of field – Stokes theorem (No proof)-Gauss divergence theorem (No proof) - The Maxwell's equations in integral form and differential form - wave equation; Plane electromagnetic waves in vacuum - properties of electromagnetic waves: speed, amplitude, phase, orientation and waves in matter - Energy and momentum in EM waves-Poynting's vector - Cell-phone reception.

UNIT III	OPTICS AND LASERS	9

Reflection and refraction of light waves - total internal reflection –

types of optical fiber, Numerical Aperture and acceptance angle - interference –Theory of air wedge and experiment. Theory of laser - characteristics - Spontaneous and stimulated emission - Einstein's coefficients(Qualitative) - population inversion - CO2 laser, semiconductor laser (Homo junction) - Applications of lasers in industry.

UNIT IV	BASIC QUANTUM MECHANICS	9

Photons and light waves - Electrons and matter waves –Compton effect - The Schrodinger equation (Time dependent and time independent forms) - meaning of wave function - Normalization – Free particle - particle in a infinite potential well: 1D,2D and 3D Boxes- Normalization, probabilities and the correspondence principle.

UNIT V	ADVANCED QUANTUM MECHANICS	9

The harmonic oscillator(qualitative)- Barrier penetration and quantum tunneling(qualitative)- Tunneling microscope - Resonant diode - Finite potential wells (qualitative)- Bloch's theorem for particles in a periodic potential –Basics of Kronig-Penney model and origin of energy bands.

TOTAL: 45 PERIODS

PRACTICAL EXERCISES: (Any Seven Experiments)

1. Torsional pendulum - Determination of rigidity modulus of wire and moment of inertia of regular and irregular objects
2. Simple harmonic oscillations of cantilever
3. Non-uniform bending- Determination of Young's modulus
4. Uniform bending–Determination of Young's modulus
5. Laser-Determination of the wavelength of the laser using grating
6. Airwedge- Determination of thickness of a thinsheet /wire

7. a) Optical fibre-Determination of Numerical Aperture and acceptance angle b) Compact disc-Determination of width of the groove using laser. 8. Acoustic grating-Determination of velocity of ultrasonic waves in liquids. 9. Ultrasonic interferometer–determination of the velocity of sound and compressibility of liquids 10. Post office box-Determination of Band gap of a semiconductor. 11. Photoelectric effect 12. Michelson Interferometer. 13. Melde's string experiment 14. Experiment with lattice dynamics kit.	
TOTAL: 30 PERIODS	
COURSE OUTCOMES:	
After completion of the course, the students will be able to:	
CO1:	Determine the mechanical properties of materials.
CO2:	Apply the principles of electromagnetic waves to real world system.
CO3:	Determine the thickness of thin wire and the characteristic parameter of an optical fiber.
CO4:	Apply the principles of lasers to real world application.
CO5:	Organize the quantum mechanical properties of particles and waves.
CO6:	Utilize the quantum mechanical principles towards the formation of energy bands.
TEXT BOOKS:	
1	D.Kleppner and R.Kolenkow, "An Introduction to Mechanics", McGraw Hill Education (Indian Edition), 2017.
2	Arthur Beiser, Shobhit Mahajan, S. Rai Choudhury, "Concepts of Modern Physics", McGraw-Hill (Indian Edition), 2017.

REFERENCES:	
1	R.Wolfson," Essential University Physics", Volume 1 & 2. Pearson Education (Indian Edition), 2009.
2	Paul A. Tipler, "Physic – Volume 1 & 2", CBS, (Indian Edition), 2004.
3	K.Thyagarajan and A.Ghatak,"Lasers: Fundamentals and Applications," Laxmi Publications, (Indian Edition), 2019.
4	D.Halliday, R.Resnick and J.Walker, "Principles of Physics", Wiley (Indian Edition), 2015.
5	N.Garcia, A.Damask and S.Schwarz, "Physics for Computer Science Students",Springer Verlag, 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	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	-	-

Recommended by Board of Studies	28-07-2023		
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23CY111	ENGINEERING CHEMISTRY	L	T	P	C
		3	0	2	4

COURSE OBJECTIVES:

- To inculcate sound understanding of water quality parameters and water treatment techniques.
- To impart knowledge on the basic principles and preparatory methods of nanomaterials.
- To introduce the basic concepts and applications of phase rule and composites.
- To facilitate the understanding of different types of fuels, their preparation, properties and combustion characteristics.
- To familiarize the students with the operating principles, working processes and applications of energy conversion and storage batteries.

UNIT I	WATER AND ITS TREATMENT	9

Water: Sources and impurities, Water quality parameters: Definition and significance of-color, odour, turbidity, pH, hardness, alkalinity, TDS, COD and BOD, flouride and arsenic. Sewage treatment primary treatment and disinfection (UV, Ozonation, break-point chlorination). Hardness-Estimation of Hardness of water by EDTA-numerical Problems-Desalination of brackish water: Reverse Osmosis. Boiler troubles: Scale and sludge, Boiler corrosion, Caustic embrittlement, Priming &foaming. Treatment of boiler feed water: Internal treatment (phosphate, colloidal, sodium aluminate and calgon conditioning) and External treatment – Ion exchange demineralization and zeolite process

UNIT II	NANOCHEMISTRY	9

Basics: Distinction between molecules, nanomaterials and bulk materials; Size-dependent properties (optical, electrical, mechanical and magnetic); Types of nanomaterials (Metal oxide and Metal) Synthesis and Characterization of nanomaterials: sol-gel, solvothermal, laser ablation, chemical

vapour deposition, electrochemical deposition and electro spinning. Applications of nanomaterials in medicine, energy, sensor , electronics and catalysis.

UNIT III	PHASE RULE AND COMPOSITES	9

Phase rule: Introduction, definition of terms with examples. One component system – water system; CO_2 system; Reduced phase rule; Two component system: lead-silver system – Pattinson process. Composites: Definition & Need for composites; Constitution: Matrix materials (Polymer matrix, metal matrix and ceramic matrix) and Reinforcement (fiber, particulates, flakes and whiskers). Properties and applications of: Metal matrix composites (MMC), Ceramic matrix composites and Polymer matrix composites. Hybrid composites – definition and examples.

UNIT IV	FUELS AND COMBUSTION	9

Fuels: Fossil Fuels, Classification of fuels; Coal and coke: Analysis of coal (proximate and ultimate), Carbonization, Manufacture of metallurgical coke (Otto Hoffmann method). Petroleum and Diesel: Manufacture of synthetic petrol (Bergius process), Knocking – octane number, diesel oil – cetane number; Power alcohol and biodiesel. Combustion of fuels: Introduction: Calorific value – higher and lower calorific values, Theoretical calculation of calorific value; Ignition temperature: spontaneous ignition temperature, Explosive range; Flue gas analysis – ORSAT Method. CO_2 emission and carbon sequestration, Green Hydrogen.

UNIT V	ENERGY SOURCES AND STORAGE DEVICES	9

Nuclear fission and fusion- light water nuclear power plant, breeder reactor. Solar energy conversion: Principle, working and applications of solar cells; Recent developments in solar cell materials. Wind energy; Geothermal energy; Batteries: Types of batteries, Primary battery – dry cell, Secondary battery – lead acid battery and lithium-ion battery; Electric vehicles – working

principles; Fuel cells: H_2-O_2 fuel cell, microbial fuel cell and its advanced technology, supercapacitor.	
TOTAL: 45 PERIODS	
LIST OF EXPERIMENTS	**TOTAL: 30 PERIODS**
1. Determination of hardness causing salts in water sample by EDTA method. 2. Determination of alkalinity in water sample. 3. Determination of chloride content of water sample by argentometric method. 4. Determination of strength of given Barium chloride using conductivity meter. 5. Determination of strength of Acid using pH meter. 6. Determination of strength of FAS by potentiometer 7. Determination of strength of acids in a mixture using conductivity meter. 8. Preparation of nanoparticles (TiO_2/ZnO/CuO) by Sol-Gel method. **9.** Estimation of Nickel in steel	
COURSE OUTCOMES:	
After completion of the course, the students will be able to:	
CO1:	Interpret the quality of water from quality parameter data and propose suitable treatment methodologies to treat water.
CO2:	Illustrate the basic concepts of nanoscience and nanotechnology in designing the synthesis of nanomaterials for engineering and technology applications.
CO3:	Estimate the knowledge of phase rule and composites for material selection requirements
CO4:	Choose a suitable fuel for engineering processes and applications
CO5:	Relate the different forms of energy resources and apply them for suitable applications in energy sectors.
CO6:	Explain the different types of batteries, fuel cells and working principles of Electric vehicles

TEXT BOOKS:	
1	P. C. Jain and Monica Jain, "Engineering Chemistry", 17th Edition, Dhanpat Rai Publishing Company (P) Ltd, New Delhi, 2018.
2	Sivasankar B., "Engineering Chemistry", Tata McGraw-Hill Publishing Company Ltd, New Delhi, 2008.
3	S.S. Dara, "A Text book of Engineering Chemistry", S. Chand Publishing, 12th Edition, 2018.Grewal.B.S., "Higher Engineering Mathematics", Khanna Publishers, New Delhi, 44th Edition, 2018.
REFERENCES:	
1	B. S. Murty, P. Shankar, Baldev Raj, B. B. Rath and James Murday, "Text book of nanoscience and nanotechnology", Universities Press-IIM Series in Metallurgy and Materials Science, 2018.
2	O.G. Palanna, "Engineering Chemistry" McGraw Hill Education (India) Private Limited, 2nd Edition, 2017.
3	Friedrich Emich, "Engineering Chemistry", Scientific International PVT, LTD, New Delhi, 2014New Delhi, 2018.
4	ShikhaAgarwal, "Engineering Chemistry-Fundamentals and Applications", Cambridge University Press, Delhi, Second Edition, 2019
5	O.V. Roussak and H.D. Gesser, Applied Chemistry-A Text Book for Engineers and Technologists, Springer Science Business Media, New York, 2nd Edition, 2013

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	2	1	-	-	-	-	2	-	-	-	-	1	2	-	-
3	2	1	-	-	-	-	2	-	-	-	-	1	2	-	-
4	3	2	1	1	-	-	3	-	-	-	-	2	3	-	-
5	3	2	1	1	-	-	3	-	-	-	-	2	3	-	-
6	2	1	-	-	-	-	2	-	-	-	-	1	2	-	-
Overall Correlation	**3**	**2**	**1**	**1**	**-**	**-**	**3**	**-**	**-**	**-**	**-**	**2**	**3**	**-**	**-**

Recommended by Board of Studies	**28-07-2023**		
Approved	**1st ACM**	**Date**	**09-09-2023**

23AM121	PROGRAMMING IN C AND C++ LABORATORY	L	T	P	C
		0	0	4	2

COURSE OBJECTIVES:

- To familiarize with C programming constructs.
- To develop programs in C using basic constructs.
- To develop programs in C using arrays, strings and Pointers
- To develop programs in C++ using class and objects.
- To develop applications in C++ using operator overloading.
- To develop applications in C using inheritance and polymorphism.

LIST OF EXPERIMENTS:

1	a) Write a C program to find sum and average of three numbers. b) Write a C program to find the sum of individual digits of a given positive integer. c) Write a C program to generate the first n terms of the Fibonacci sequence.
2	a) Write a C program to generate prime numbers between 1 to n. b) Write a C program to Check whether given number is Armstrong Number or Not. c) Write a C program to evaluate algebraic expression (ax+b)/(ax-b).
3	a) Write a C program to find the roots of a quadratic equation. b) Write a C program that performs arithmetic operations using switch statement.
4	a) Write a C program to find factorial of a given integer using non-recursive function. b) Write a C program to find factorial of a given integer using recursive function

5	a) Write a C program to find both the largest and smallest number in a list of integers. b) Write a C Program to Sort the Array in an Ascending Order. c) Write a C Program to find whether the given matrix is symmetric or not.
6	To write a C program to add and multiply two matrices.
7	a) To write a C program to sort the names in alphabetical order using string function. b) To write a C program to calculate area of a triangle using pointers and functions.
8	Write a Program to design a class having static member function named showcount() which has the property of displaying the number of objects created of the class.
9	Write a Program using class to process Shopping List for a Departmental Store. The list includes details such as the Code No and Price of each item and perform the operations like Adding, Deleting Items to the list and Printing the Total value of an Order.
10	Write a Program which creates & uses an array of objects of a class.(for e.g. implementing the list of Managers of a Company having details such as Name, Age, etc..).
11	Write a Program to find Maximum out of Two Numbers using friend function. Note: Here one number is a member of one class and the other number is a member of some other class.
12	Write a Program to overload operators like *, <<, >> using friend function. The following overloaded operators should work for a class vector.
13	Write a Program to design a student class representing student roll no. and a test class (derived class of student) representing the scores of the student in various subjects and sports class representing the score in sports. The sports and test class should be inherited by a result class having

	the functionality to add the scores and display the result for a student.
14	Write a program illustrating the use of virtual functions in class.

TOTAL: 60 PERIODS

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	1	-
2	3	2	1	1	1	-	-	-	-	-	-	1	3	1	-
3	3	2	1	1	1	-	-	-	-	-	-	1	3	1	-
4	3	2	1	1	1	-	-	-	-	-	-	1	3	1	-
5	3	3	2	2	1	-	-	-	-	-	-	1	3	1	-
6	2	1	-	-	1	-	-	1	1	1	1	1	3	1	1
Overall Correlation	**3**	**2**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**3**	**1**	**1**

Recommended by Board of Studies	**28-07-2023**		
Approved	**1st ACM**	**Date**	**09-09-2023**

23HS121	COMMUNICATION SKILLS LABORATORY	L	T	P	C
		0	0	2	1

COURSE OBJECTIVES:

- To enable the students to comprehend the main idea and specific information of the listening passage
- To help students express themselves clearly, and communicate effectively with others.
- To introduce authentic language use and context-specific vocabulary that might not be encountered in textbooks.

Exercise : 1	Listening to conversations set in everyday social context and complete gap-filling exercise
Exercise : 2	Listening to a monologue in everyday social context. Diagram labelling and MCQ
Exercise : 3	Listening to a group conversation in academic setting and answer MCQ
Exercise : 4	Listening to a lecture and answer MCQ or gap filling
Exercise : 5	Listening to Ted Talks, podcasts, documentaries - discussion
Exercise : 6	Listening to a lecture and reading a text on the same subject- compare and contrast
Exercise : 7	Speaking Introducing oneself
Exercise : 8	Answering questions based on the introduction
Exercise : 9	Speaking on a given prompt for 2 mins.
Exercise :10	Answering questions based on the topic spoken
Exercise :11	Role play- Engaging in conversation
Exercise :12	Engaging in Podcast Discussion

TOTAL: 25 PERIODS

COURSE OUTCOMES:

After completion of the course, the students will be able to:

CO1:	Demonstrate fluency in speaking in variety of situations
CO2:	Express their knowledge by talking continuously for more than two minutes on a topic

CO3:	Develop active listening for more meaningful interactions and conversations
CO4:	Use a full range of structures naturally and appropriately
CO5:	Identify the specific information in conversations, interviews, talks and lectures
CO6:	Develop the ability to compare and analyse different forms of information, identifying key similarities and differences.

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	-	-	-	-	-	-	-	-	2	3	-	2	-	-	-
3	-	-	-	-	-	1	1	-	2	3	-	2	-	-	-
4	-	-	-	-	-	-	-	-	-	3	-	2	-	-	-
5	-	-	-	-	-	1	1	-	3	3	-	2	-	-	-
6	-	-	-	-	-	1	1	-	2	3	-	-	-	-	-
Overall Correlation	-	-	-	-	-	**1**	**1**	-	**3**	**3**	-	**2**	-	-	-

Recommended by Board of Studies	**28-07-2023**		
Approved	**1st ACM**	**Date**	**09-09-2023**

SEMESTER - II

23HS201	PROFESSIONAL ENGLISH	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To help learners extract information from longer, technical and scientific texts
- To familiarize learners with different text structures by engaging them in reading, writing and grammar learning activities
- To help learners write coherent, extensive reports and essays.
- To enable learners to use language efficiently while expressing their opinions in professional and business situations

UNIT I	WORKPLACE COMMUNICATION	9

Reading – Reading brochures (technical context), advertisements, telephone messages, gadget reviews social media messages, digital communication relevant to technical contexts and business. Writing – Writing emails -emails on professional contexts including introducing oneself, writing checklist, writing single sentence definition, product description- advertising or marketing slogans, Language Development– Tenses, Concord, Question types: Wh/ Yes or No/ and Tags, imperative sentences, complex sentences. Vocabulary - One-word substitutes; Abbreviations & Acronyms as used in technical contexts and social media.

UNIT II	EXPRESSING CAUSE AND EFFECT	9

Reading - Reading longer technical texts– Cause and Effect Essays, and emails of complaint. Writing - writing complaint emails (raising tickets) and responses to complaints, writing Cause and effect paragraphs and essays. Language Development– Active, Passive and Impersonal Passive Voice transformations, Infinitive and Gerunds Vocabulary – Synonyms- contextual meaning of

words, Same word acting as different parts of speech, causal expressions.		
UNIT III	**PROVIDING SOLUTIONS TO PROBLEMS**	**9**
Reading - Case Studies, editorials, news reports etc. Writing – Letter to the Editor, Writing instructions and recommendations, Problem solution essay / Argumentative Essay, Language Development – Error correction; If conditional sentences Vocabulary - Compound Words, discourse markers.		
UNIT IV	**INTERPRETATION OF GRAPHICS**	**9**
Reading - Reading newspaper articles, nonverbal communication (charts and graphs) Writing –Transferring information from nonverbal (chart, graph etc, to verbal mode) Process– description. Language development–Possessive & Relative pronouns, numerical adjectives Vocabulary Homonyms and Homophones, sequence words.		
UNIT V	**REPORT WRITING AND RESUME WRITING**	**9**
Reading – Company profiles, journal reports. Language Development– Reported Speech Vocabulary-reporting words and phrases. Writing - Writing accident report, survey report and progress report, project proposal, minutes of the meeting, writing statement of purpose, internship application and resume		
		TOTAL: 45 PERIODS
COURSE OUTCOMES:		
After completion of the course, the students will be able to:		
CO1:	Summarize long technical and scientific text of not less than 500 words recognizing main ideas and specific details	
CO2:	Demonstrate the understanding of more complex grammatical structures and diction while reading and writing	
CO3:	Use appropriate expressions to describe process and product, compare and contrast data, analyze problems, provide solutions and prove an argument in writing	

CO4:	Establish the ability to communicate effectively in professional environment through emails and reports
CO5:	Determine the language use appropriate for different social media platforms used for digital marketing
CO6:	Convert skills to assets and position themselves in job market through their own professional narratives
TEXT BOOKS:	
1	V. Chellammal, Deepa Mary Francis, K N Shoba, P R Sujatha Priyadharshini, Veena Selvam, English for Science & Technology I, Cambridge University Press and Assessment
2	V. Chellammal, Deepa Mary Francis, K N Shoba, P R Sujatha Priyadharshini, Veena Selvam, English for Science & Technology II, Cambridge University Press and Assessment
REFERENCES:	
1	Business Correspondence and Report Writing by Prof. R.C. Sharma & Krishna Mohan, Tata McGraw Hill & Co. Ltd., 2001, New Delhi.
2	Developing Communication Skills by Krishna Mohan, Meera Bannerji- Macmillan India Ltd. 1990, Delhi.

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	-	-	-	-	-	-	-	-	2	3	-	2	-	-	-
3	-	-	-	-	-	-	1	-	2	3	-	2	-	-	-
4	-	-	-	-	-	-	-	-	2	3	-	2	-	-	-
5	-	-	-	-	-	-	1	-	2	3	-	2	-	-	-
6	-	-	-	-	-	-	-	-	2	3	-	3	-	-	-
Overall Correlation	-	-	-	-	-	1	1	-	2	3	-	3	-	-	-

Recommended by Board of Studies	**28-07-2023**		
Approved	**1st ACM**	**Date**	**09-09-2023**

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	ALGEBRAIC STRUCTURES	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	LATTICES AND BOOLEAN ALGEBRA	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.		
		TOTAL: 60 PERIODS
COURSE OUTCOMES:		
After completion of the course, the students will be able to:		
CO1:	Apply the concepts of propositional and predicate calculus to the given logical statements.	
CO2:	Apply the idea of combinatorial techniques to various engineering problems.	
CO3:	Find the solutions for technical problems using graphs.	
CO4:	Apply the concepts and properties of algebraic structures in computational theory.	
CO5:	Apply the lattice structure and its properties to engineering problems.	
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.	
REFERENCES:		
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	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	-	-

Recommended by Board of Studies	**08-04-2023**		
Approved by Academic	**2nd ACM**	**Date**	**25-05-2025**

23PH205	PHYSICS FOR INFORMATION SCIENCE	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To make the students understand the importance in studying electrical properties of materials.
- To enable the students to gain knowledge in semiconductor physics
- To instill knowledge on magnetic properties of materials.
- To establish a sound grasp of knowledge on different optical properties of materials, optical displays and applications
- To inculcate an idea of significance of nano structures, quantum confinement, ensuing nano device applications and quantum computing.

UNIT I	ELECTRICAL PROPERTIES OF MATERIALS	9

Classical free electron theory - Expression for electrical conductivity – Thermal conductivity, expression - Wiedemann-Franz law – Success and failures - electrons in metals – Particle in a three-dimensional box – degenerate states – Fermi- Dirac statistics – Density of energy states – Electron in periodic potential – Energy bands in solids – tight binding approximation - Electron effective mass – concept of hole.

UNIT II	SEMICONDUCTOR PHYSICS	9

Intrinsic Semiconductors – Energy band diagram – direct and indirect band gap semiconductors – Carrier concentration in intrinsic semiconductors – extrinsic semiconductors - Carrier concentration in N-type & P-type semiconductors – Variation of carrier concentration with temperature – variation of Fermi level with temperature and impurity concentration – Carrier transport in Semiconductor: random motion, drift, mobility and diffusion (qualitative) – Hall effect and devices – Ohmic contacts – Schottky diode – introduction to solid state drive (SSD)

UNIT III	MAGNETIC PROPERTIES OF MATERIALS	9

Magnetic dipole moment – atomic magnetic moments- magnetic permeability and susceptibility - Magnetic material classification:

diamagnetism – paramagnetism – ferromagnetism – antiferromagnetism – ferrimagnetism – Ferromagnetism: origin and exchange interaction- saturation magnetization and Curie temperature – Domain Theory- M versus H behaviour – Hard and soft magnetic materials – examples and uses-– Magnetic principle in computer data storage – Magnetic hard disc (GMR sensor).		
UNIT IV	**OPTICAL PROPERTIES OF MATERIALS**	**9**
Classification of optical materials – carrier generation and recombination processes - Absorption emission and scattering of light in metals, insulators and semiconductors (concepts only) - photo current in a P-N diode – solar cell - LED – Organic LED – Laser diodes – Optical data storage techniques.		
UNIT V	**NANODEVICES AND QUANTUM COMPUTING**	**9**
Introduction - quantum confinement – quantum structures: quantum wells, wires and dots –- band gap of nanomaterials. Tunneling – Single electron phenomena: Coulomb blockade - resonant- tunneling diode – single electron transistor – quantum cellular automata - Quantum system for information processing - quantum states – classical bits – quantum bits or qubits –CNOT gate - multiple qubits – Bloch sphere – quantum gates – advantage of quantum computing over classical computing.		
TOTAL: 45 PERIODS		
COURSE OUTCOMES:		
After completion of the course, the students will be able to:		
CO1:	Apply the knowledge of classical and quantum electron theories to energy band structures.	
CO2:	Utilize the basics of intrinsic and extrinsic semiconductor physics and its application in various devices.	
CO3:	Apply the knowledge of magnetic properties of materials in data storage.	
CO4:	Explain the electro optical properties and optoelectronic devices.	
CO5:	Explain the quantum structures, quantum confinement and Nano devices.	

CO6:	Explain the role of quantum structures in information processing technique.
TEXT BOOKS:	
1	Jasprit Singh, "Semiconductor Devices: Basic Principles", Wiley (Indian Edition), 2007.
2	S.O. Kasap. Principles of Electronic Materials and Devices, McGraw-Hill Education (Indian Edition), 2020.
3	Parag K. Lala, Quantum Computing: A Beginner's Introduction, McGraw-Hill Education (Indian Edition), 2020.
REFERENCES:	
1	Charles Kittel, Introduction to Solid State Physics, Wiley India Edition, 2019.
2	Y.B.Band and Y.Avishai, Quantum Mechanics with Applications to Nanotechnology and Information Science, Academic Press, 2013.
3	V.V.Mitin, V.A. Kochelap and M.A.Stroscio, Introduction to Nanoelectronics, Cambridge Univ.Press, 2008.
4	G.W. Hanson, Fundamentals of Nanoelectronics, Pearson Education (Indian Edition) 2009.
5	B.Rogers, J.Adams and S.Pennathur, Nanotechnology: Understanding Small Systems, CRC 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	3	-	-
2	3	2	1	1	-	-	-	-	-	-	-	1	3	-	-
3	3	2	1	1	-	-	-	-	-	-	-	1	3	-	-
4	2	1	-	-	-	-	-	-	-	-	-	1	2	-	-
5	2	1	-	-	-	-	-	-	-	-	-	1	2	-	-
6	2	1	-	-	-	-						1	2		
Overall Correlation	**3**	**2**	**1**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**3**	**-**	**-**

Recommended by Board of Studies	**28-07-2023**		
Approved	**1st ACM**	**Date**	**09-09-2023**

23IT201	DATA STRUCTURES AND ALGORITHMS	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To impart the basic concepts of data structures and algorithms.
- To be familiar with writing recursive methods.
- To implement operations on Linked List, Stack and Queues.
- To implement traversal operations of trees and graphs.
- To understand concepts about various algorithm design techniques, searching and sorting techniques.

UNIT I	INTRODUCTION TO ALGORITHMS	9

Introduction to Data vs Information - Data Structures - Classification Abstraction - Abstract data types (ADT) - Array - Characteristics - Storage Representations. Array Order Reversal- Recursion- Array operations, Algorithm- complexity Time and Space trade off.

UNIT II	LINKED LIST	9

Array vs Linked List Singly linked list - Representation of a linked list in memory - Operations on a singly linked list - Merging two singly linked lists into one list - Reversing a singly linked list Polynomial Manipulation using List - Advantages and disadvantages of singly linked list - Circular linked list- Doubly linked list - Circular Doubly Linked List.

UNIT III	STACKS & QUEUES	9

Introduction Array Representation of a Stack Linked List Representation of a Stack - Stack Operations - Algorithm for Stack Operations - Stack Applications: Tower of Hanoi - Infix to postfix Transformation - Evaluating Arithmetic Expressions. Queue Introduction Array Representation of Queue Linked List Representation of Queue - Queue Operations - Algorithm for Queue Operations - Queue Applications: Priority Queue.

UNIT IV	TREES AND GRAPHS	9
Preliminaries of Tree ADT - Binary Trees - The Search Tree ADT Binary Search Trees - AVL Trees - Tree Traversals - B-Trees – Heap Tree Preliminaries of Graph ADT - Representation of Graph, Graph Traversal - BFS DFS Applications of Graph Shortest – Path Algorithms Minimum Spanning Tree Prims Algorithm.		
UNIT V	**GRAPH ALGORITHM DESIGN TECHNIQUES AND SEARCHING AND SORTING TECHNIQUES**	**9**
Divide and Conquer Strategy - Greedy Algorithm - Dynamic Programming - Backtracking Strategy - List Searches using Linear Search - Binary Search – Fibonacci Search - Sorting Techniques - Insertion sort - Heap sort - Bubble sort - Quick sort - Merge sort - Analysis of sorting techniques.		
		TOTAL: 45 PERIODS

COURSE OUTCOMES:	
	After completion of the course, the students will be able to:
CO1:	Illustrate the concept of recursive algorithms.
CO2:	Demonstrate the different types of data structures.
CO3:	Illustrate the operations on linear data structures.
CO4:	Select appropriate data structure as applied to specified problem definition.
CO5:	Explain and implement the various algorithm design techniques.
CO6:	Identify appropriate sort and search algorithm for a given application.

TEXT BOOKS:	
1	Jean-Paul Tremblay, Paul G. Sorenson, 'An Introduction to Data Structures with Application', TMH, 2017.
2	Cormen, T. H., Leiserson, C. E., Rivest, R. L., & Stein, C., "Introduction to algorithms", 3rd edition, MIT.

REFERENCES:	
1	Richard F, Gilberg, Forouzan, "Data Structures", Cengage, 2nd Edition, 2004.
2	Darren R. Hayes, "Practical Guide to Computer Forensics Investigations", 2014.
3	Larry R. Nyhoff, ADTs, "Data Structures, and Problem Solving with C++", Prentice Hall Edition, 2004.
4	Thomas H. Cormen, Charles E. Leiserson, "Introduction to Algorithms", 3rd Edition, 2010

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

Recommended by Board of Studies	28-07-2023		
Approved by Academic	1st ACM	Date	09-09-2023

23HS203	TAMILS AND TECHNOLOGY	L	T	P	C
		1	0	0	1

COURSE OBJECTIVES:

- To summarize the weaving industry and ceramic technology during Sangam Age
- To explain the design and construction of houses during Sangam Age and the sculptures and temples of Chola,Pallava and Pandya period
- To Explain about the water bodies of Sangam age and relate it to the agricultural usage
- To Outline to students the agriculture and irrigation technology during the Chola Period
- To help students Interpret and explain the digitalization of Tamil books and development of Tamil software

UNIT I	WEAVING AND CERAMIC TECHNOLOGY	3

Weaving Industry during Sangam Age – Ceramic technology – Black and Red Ware Potteries (BRW) – Graffiti on Potteries.

UNIT II	DESIGN AND CONSTRUCTION TECHNOLOGY	3

Designing and Structural construction House & Designs in household materials during Sangam Age - Building materials and Hero stones of Sangam age – Details of Stage Constructions in Silappathikaram - Sculptures and Temples of Mamallapuram – Great Temples of Cholas and other worship places - Temples of Nayaka Period - Type study (Madurai Meenakshi Temple)- Thirumalai Nayakar Mahal - Chetti Nadu Houses, Indo - Saracenic architecture at Madras during British Period.

UNIT III	MANUFACTURING TECHNOLOGY	3

Art of Ship Building - Metallurgical studies - Iron industry - Iron smelting, steel -Copper and gold- Coins as source of history - Minting of Coins – Beads making-industries Stone beads - Glass beads - Terracotta beads -Shell beads/ bone beats - Archeological evidences – Gem stone types described in Silappathikaram.

UNIT IV	AGRICULTURE AND IRRIGATION TECHNOLOGY	3
Dam, Tank, ponds, Sluice, Significance of Kumizhi Thoompu of Chola Period, Animal Husbandry - Wells designed for cattle use - Agriculture and Agro Processing - Knowledge of Sea - Fisheries – Pearl - Conche diving - Ancient Knowledge of Ocean - Knowledge Specific Society.		
UNIT V	**SCIENTIFIC TAMIL & TAMIL COMPUTING**	**3**
Development of Scientific Tamil - Tamil computing – Digitalization of Tamil Books –Development of Tamil Software – Tamil Virtual Academy – Tamil Digital Library – Online Tamil Dictionaries – Sorkuvai Project.		
TOTAL: 15 PERIODS		
COURSE OUTCOMES:		
After completion of the course, the students will be able to:		
CO1:	Summarize the weaving industry and ceramic technology during Sangam Age	
CO2:	Explain the design and construction of houses during Sangam Age	
CO3:	Explain the sculptures and temples of Chola,Pallava and Pandya period.	
CO4:	Explain about the water bodies of Sangam age and relate it to the agricultural usage	
CO5:	Outline the agriculture and irrigation technology during the Chola Period.	
CO6:	Interpret and explain the digitalization of tamil books and development of Tamil software	
TEXT BOOKS:		
1	Dr.K.K.Pillay ,"Social Life of Tamils", A joint publication of TNTB & ESC and RMRL	

REFERENCES:	
1	Dr.S.Singaravelu ,"Social Life of the Tamils - The Classical Period", Published by: International Institute of Tamil Studies.
2	Dr.S.V.Subatamanian , Dr.K.D. Thirunavukkarasu, "Historical Heritage of the Tamils", Published by: International Institute of Tamil Studies

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

Recommended by Board of Studies	28-07-2023		
Approved	1st ACM	Date	09-09-2023

23EE281	BASIC ELECTRICAL AND ELECTRONICS ENGINEERING	L	T	P	C
		2	0	2	3

COURSE OBJECTIVES:

- To introduce the basics of electric circuits and analysis
- To impart knowledge in the basics of working principles and application of electrical machines
- To introduce analog devices and their characteristics
- To educate on the fundamental concepts of digital electronics, functional elements and working of measuring instruments
- To demonstrate the load test on DC machines, working of PN Junction diodes, Zener diodes and rectifiers.

UNIT I	ELECTRICAL CIRCUITS	6

DC Circuits: Circuit Components: Conductor, Resistor, Inductor, Capacitor– Ohm 's Law-Kirchhoff's Laws -Nodal Analysis, Mesh analysis with independent sources only (Steady State)- Introduction to AC Circuits –Steady state analysis of RL, RC, and RLC circuits (Simple problems only).

UNIT II	ELECTRICAL MACHINES	6

Construction and Working principle of DC Generators, EMF equation, Types and Applications- Working Principle of DC motors, Torque Equation, Types and Applications. - Construction, Working principle and Applications of Single- Phase Transformer.

UNIT III	ANALOG ELECTRONICS	6

PN Junction Diodes, Zener Diode–Characteristics & Applications– Bipolar Junction Transistor, JFET, SCR, MOSFET, – Types, I-V Characteristics and Applications – Rectifier.

UNIT IV	DIGITAL ELECTRONICS	6

Review of number systems, Combinational logic (adder and subtractor) – representation of logic functions-SOP and POS forms, K-map representations and minimization using K-maps (up to 3 variables).

UNIT V	MEASUREMENTS AND INSTRUMENTATION	6
Functional elements of an instrument, Standards and calibration, Operating Principle, types- Moving Coil and Moving Iron meters, Instrument Transformers- CT and PT, DSO-Block Diagram		
		Total : 30 PERIODS

LAB COMPONENT

1. Verification of Ohms and Kirchhoff's Laws.
2. Load test on DC Shunt Motor.
3. Characteristics of PN and Zener Diodes
4. Design and analysis of Half wave and Full Wave rectifiers
5. Implementation of Binary Adder and Subtractor
6. Study of DSO

Total : 30 + 30 = 60 Periods

COURSE OUTCOMES:

After completion of the course, the students will be able to:

CO1:	Apply fundamental laws to DC electric circuits and demonstrate it experimentally.
CO2:	Explain the steady state AC circuits with RL, RC, and RLC circuits
CO3:	Identify the working principle and applications of electrical machines with experimental results
CO4:	Demonstrate the characteristics of various analog electronic devices
CO5:	Experiment with the basic concepts of digital electronics and demonstrate the implementation of Binary Adder and Subtractor
CO6:	Illustrate the operating principles of measuring instruments and demonstrate DSO for the basic measurements.

TEXT BOOKS:

1	Kothari D P and I.J Nagrath,—Basic Electrical and Electronics Engineering‖ , Second Edition, McGraw Hill Education,2020
2	Sedha R. S.,—A textbook book of Applied Electronics‖, S. Chand & Co.,2008

3	A.K. Sawhney, Puneet Sawhney _A Course in Electrical & Electronic Measurements & Instrumentation', Dhanpat Rai and Co, 2015.
REFERENCES:	
1	Kothari D P and I.J Nagrath, —Basic Electrical Engineering‖, Fourth Edition, Mc Graw Hill Education, 2019.
2	S.K. Bhattacharya —Basic Electrical and Electronics Engineering‖, Pearson Education, Second Edition, 2017.
3	Thomas L. Floyd,_ Digital Fundamentals', 11thEdition,Pearson Education,2017.
4	Albert Malvino, David Bates, _Electronic Principles, McGraw Hill Education; 7th edition, 2017.
5	Mahmood Nahvi and Joseph A. Edminister, —Electric Circuits‖, 86 Schaum 'Outline Series, McGraw Hill, 2002.
6	H.S. Kalsi, _Electronic Instrumentation' , Tata McGraw-Hill, New Delhi, 2010
7	James A. Svoboda, Richard C. Dorf,— Dorf's Introduction to Electric Circuits‖, Wiley, 2018.

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	-	1
2	2	1	-	-	-	-	-	1	1	1	-	1	2	-	1
3	3	2	1	1	-	1	1	1	1	1	-	1	3	-	1
4	2	1	-	-	-	1	1	1	1	1	-	1	2	-	1
5	3	2	1	1	-	-	-	1	1	1	-	1	3	-	1
6	2	1	-	-	-	-	-	1	-	-	-	-	3	-	1
Overall Correlation	**3**	**2**	**1**	**1**	**-**	1	1	1	1	1	-	1	**3**	**-**	1

Recommended by Board of Studies	**28-07-2023**		
Approved	**1st ACM**	**Date**	**09-09-2023**

23ME211	ENGINEERING GRAPHICS	L	T	P	C
		3	0	2	4

COURSE OBJECTIVES:

- Gain a solid foundation in the fundamental principles and concepts of engineering graphics, including conic sections, orthographic projection, isometric projection, section views and development of surfaces, perspective projection, and dimensioning.
- Develop graphic skills for communication of concepts, ideas and design of engineering products.
- Gain knowledge on drafting software to construct part models.
- Familiarize with existing national standard practices and conventions related to technical drawings.
- Enhance the ability to visualize objects in three dimensions and translate them into 2D representations.

UNIT I	PLANE CURVES	9+6

Basic Geometrical constructions, Curves used in engineering practices: Conics - Construction of ellipse, parabola and hyperbola by eccentricity method - Construction of cycloid - construction of involutes of square and circle - Drawing of tangents and normal to the above curves.

LIST OF EXERCISES:

1. Drawing of a title block with necessary text, projection symbol and lettering using drafting software
2. Drafting of Conic curves - Ellipse, Parabola and Hyperbola

UNIT II	PROJECTION OF POINTS, LINES AND PLANE SURFACE	9+6

Orthographic projection - principles - Principal planes - First angle projection - projection of points. Projection of straight lines (only First angle projections) inclined to both the principal planes - Determination of true lengths and true inclinations by rotating line method. Projection of planes (hexagonal and pentagonal planes

only) inclined to both the principal planes by rotating object method.

LIST OF EXERCISES:

1. Draw the projection of points when it is placed in different quadrants
2. Draw the projection of lines when it is placed in first quadrant
3. Draw the planes when it is placed in first quadrant.

UNIT III	PROJECTION OF SOLIDS AND FREE HAND SKETCHING	9+6

Projection of simple solids - hexagonal prism, pentagonal pyramid and cone inclined to the horizontal plane by rotating object method. Free Hand sketching: Visualization principles - Representation of Three Dimensional objects - Layout of views - Free hand sketching of multiple views from pictorial views of objects

LIST OF EXERCISES:

1. Practicing three dimensional modelling of simple objects.
2. Drawing of orthographic views from the given pictorial diagram

UNIT IV	PROJECTION OF SECTIONED SOLIDS AND DEVELOPMENT OF SURFACES	9+6

Sectioning of hexagonal prism, pentagonal pyramid and cone when the cutting plane is inclined to the horizontal plane, Development of lateral surfaces of simple and sectioned solids – hexagonal prism and cone cut by a plane inclined to horizontal plane only.

LIST OF EXERCISES:

1. Draw the sectioned views of prisms and pyramids
2. Draw the development of hexagonal prism cut by a section plane inclined to the horizontal plane

UNIT V	ISOMETRIC PROJECTION	9+6

Principles of isometric projection - Isometric scale – Isometric view - Isometric projections of simple solids and truncated solids - Prisms, pyramids, cylinders, cones- combination of two solid objects in simple vertical positions.

LIST OF EXERCISES:

1. Drawing Isometric view and projection of simple solids.
2. Drawing three dimensional modeling of isometric projection of combination of solids.

TOTAL: 75 PERIODS

COURSE OUTCOMES:

After completion of the course, the students will be able to:

CO1:	Construct the conic curves, involutes and cycloids.
CO2:	Develop and Sketch the orthographic projections of points, lines and plane surfaces.
CO3:	Develop and Sketch the orthographic projections of simple solids.
CO4:	Construct the projections of sectioned solids and development of the lateral surfaces of solids.
CO5:	Develop and Sketch the isometric sections of solids.
CO6:	Develop and Sketch the orthographic projection 2D and 3D objects using Auto CAD.

TEXT BOOKS:

1	Bhatt N.D. and Panchal V.M., ―Engineering Drawing‖, Charotar Publishing House, 53rd Edition, 2019.
2	Basant Agarwal and Agarwal C.M.,―Engineering Drawing‖, McGraw Hill, 2nd Edition, 2019

REFERENCES:

1	Natrajan K.V., ―A Text Book of Engineering Graphics‖, Dhanalakshmi Publishers, Chennai, 2018.
2	Gopalakrishna K.R., ―Engineering Drawing‖ (Vol. I and II combined), Subhas Publications, Bangalore, 27th Edition, 2017.

3	Luzzader, Warren.J. and Duff, John M., —Fundamentals of Engineering Drawing with an introduction to Interactive Computer Graphics for Design and Production, Eastern Economy Edition, Prentice Hall of India Pvt. Ltd, New Delhi, 2005.
4	Parthasarathy N. S. and Vela Murali, —Engineering Graphics‖, Oxford University, Press, New Delhi, 2015. 5. Shah M.B., and Rana B.C., —Engineering Drawing‖, Pearson Education India, 2nd Edition, 2009.
5	Venugopal K. and Prabhu Raja V., —Engineering Graphics", New Age International (P) Limited, 2008.

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	-	3	2	2	2	2	-
2	3	2	1	1	2	-	-	1	-	3	2	2	2	2	-
3	3	2	1	1	2	-	-	1	-	3	2	2	2	2	-
4	3	2	1	1	2	-	-	1	-	3	2	2	2	2	-
5	3	2	1	1	2	-	-	1	-	3	2	2	2	2	-
6	3	2	1	1	2	-	-	1	-	3	2	2	2	2	-
Overall Correlation	3	2	1	1	2	-	-	1	-	3	2	2	2	2	-
Recommended by Board of Studies							**28-07-2023**								
Approved							**1st ACM**			**Date**			**09-09-2023**		

23ME221	ENGINEERING PRACTICES LABORATORY	L	T	P	C
		0	0	4	2

COURSE OBJECTIVES:

- Familiarize students with basic engineering tools and equipment.
- Educate students on the importance of safety practices, including proper handling of equipment, adherence to safety protocols, and understanding potential hazards in the laboratory environment. Develop basic manufacturing and fabrication skills.
- Provide hands on training to the students in plumbing and woodworking.
- Provide hands on training to the students in welding various joints in steel plates using arc welding work; Machining various simple processes like turning, drilling, tapping in parts; Assembling simple mechanical assembly of common household equipment; Making a tray out of metal sheet using sheet metal work.
- Demonstrate the wiring and measurement methods in common household electrical applications.
- Study the basic electronic components, gates and provide hands on training in soldering.

GROUP A (CIVIL and MECHANICAL)

PART I	CIVIL ENGINEERING PRACTICES	15

PLUMBING WORK

a) Connecting various basic pipe fittings like valves, taps, coupling, unions, reducers, elbows and other components which are commonly used in households.
b) Preparation of plumbing line sketches.
c) Laying pipe connection to the suction side of a pump
d) Laying pipe connection to the delivery side of a pump.
e) Connecting pipes of different materials: Metal, plastic and flexible pipes used in household appliances.

WOOD WORK

a) Sawing
b) Planning
c) Making of T-Joint, Mortise joint and Tenon joint and Dovetail joint.

WOOD WORK STUDY

a) Study of joints in door panels and wooden furniture
b) Study of common industrial trusses using models.

PART II	**MECHANICAL ENGINEERING PRACTICES**	**15**

WELDING WORK

a) Study of Welding and its tools.
b) Welding of Butt Joints, Lap Joints and Tee Joints by metal arc welding.
c) Study of Gas Welding.

BASIC MACHINING PRACTICE

a) Facing and Plain Turning
b) Taper Turning
c) Drilling and Tapping

SHEET METAL WORK

a) Forming and Bending
b) Making of a square Tray

MACHINE ASSEMBLY WORK

a) Study of Centrifugal Pump
b) Study of Air Conditioner

FOUNDRY PRACTICE

Demonstration on Foundry operations like mould preparation.

TOTAL: 30 PERIODS

GROUP B (ELECTRICAL & ELECTRONICS)

PART III	**ELECTRICAL ENGINEERING PRACTICES**	**15**

1. Residential House wiring using Switches, Fuse, Indicators, Lamp and Energy Meter.
2. Staircase Wiring.

3. Fluorescent Lamp Wiring with Introduction to CFL and LED Types. 4. Measurement of Energy using Single Phase Energy Meter. 5. Study of Iron Box Wiring and Assembly **6.** Study of Fan Regulator – Electronic Type		
PART IV	**ELECTRONICS ENGINEERING PRACTICES**	**15**
1. Study of Electronic components and equipment – Resistors, Colour coding measurement of AC signal parameter (peak-peak, RMS period, frequency) using CRO. 2. Study of logic gates AND, OR, EX-OR and NOT. 3. Generation of Clock Signal. 4. Soldering simple electronic circuits and checking continuity. 5. Study the elements of smart phone 6. Study of LED TV (Block diagram		
COURSE OUTCOMES:		
After completion of the course, the students will be able to:		
CO1:	Plan the pipeline layout for common household plumbing work.	
CO2:	Make use of welding equipment and carpentry tool for making joints.	
CO3:	Demonstrate on centrifugal pump, air conditioner and foundry operations.	
CO4:	Demonstrate the electrical wiring connections for household applications and study the working of iron box and fan regulator.	
CO5:	Identify the basic electronic components and explain the gates and soldering methods.	
CO6:	Examine the performance and operation of CRO, LED TV and Smart phone.	

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	-	-	2	2	2	2	1	-
2	3	2	1	1	1	1	1	-	-	2	2	2	2	1	-
3	3	2	1	1	1	1	1	-	-	2	2	2	2	1	-
4	3	2	1	1	1	1	1	-	-	2	2	2	2	1	-
5	3	2	1	1	1	1	1	-	-	2	2	2	2	1	-
6	3	2	1	1	1	1	1	-	-	2	2	2	2	1	-
Overall Correlation	**3**	**2**	**1**	**1**	**1**	**1**	**1**	**-**	**-**	**2**	**2**	**2**	**2**	**1**	**-**
Recommended by Board of Studies							**28-07-2023**								
Approved							**1st ACM**			**Date**			**09-09-2023**		

23IT221	DATA STRUCTURES AND ALGORITHMS LABORATORY	L	T	P	C
		0	0	4	2

COURSE OBJECTIVES:

- To impart the basic concepts of data structures and algorithms.
- To be familiar with writing recursive methods.
- To implement operations on Linked List, Stack and Queues.
- To implement traversal operations of trees and graphs.
- To understand concepts about various algorithm design techniques, searching and sorting techniques.

PRACTICALS:

1. Program to find the largest and smallest number in an unsorted array.
2. Program to construct operations on a Singly linked list.
3. Program to implement operations on a doubly linked list.
4. Program to sort the elements using insertion sort.
5. Program to sort the elements using quick sort.
6. Program to sort the elements using merge sort.
7. Program to construct t a Stack using an array and Linked list.
8. Program to perform Queue using an array and Linked list.
9. Program to execute Circular Queue.
10. Program to convert an infix expression to postfix expression.
11. Program to achieve BFS and DFS
12. Program to implement N Queens problem.
13. Program to apply Binary Tree Traversal
14. Program to carry out Travelling Salesman Problem

TOTAL: 60 PERIODS

COURSE OUTCOMES:

After completion of the course, the students will be able to:

CO1:	Discuss the concept of data structures through ADT including List, Stack and Queues.

CO2:	Explain basic concepts about stacks, queues, lists, trees and graphs.
CO3:	Apply and implement various tree traversal algorithms and ensure their correctness.
CO4:	Apply algorithms and develop algorithms through step-by-step approach in solving problems with the help of fundamental data structures.
CO5:	Build applications and justify use of specific linear data structures for various Applications.
CO6:	Apply binary data structures for various Applications.
TEXT BOOKS:	
1	Jean-Paul Tremblay, Paul G. Sorenson, "An Introduction to Data Structures with Application", TMH, 2017.
2	Richard F, Gilberg, Forouzan, "Data Structures", Cengage, 2nd Edition,2004.
REFERENCES:	
1	Larry R. Nyhoff, "ADTs, Data Structures, and Problem Solving with C++", Prentice Hall Edition, 2004
2	Thomas H. Cormen, Charles E. Leiserson, "Introduction to Algorithms", 3rd Edition, 2010

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	-
2	2	1	-	-	1	-	-	-	-	1	-	1	2	1	-
3	3	2	1	1	1	-	-	-	-	1	-	1	2	1	-
4	3	2	1	1	1	-	-	-	-	1	-	1	2	1	-
5	3	2	1	1	1	-	-	-	-	1	-	1	2	1	-
6	3	2	1	1	1	-	-	-	-	1	-	1	2	1	-
Overall Correlation	3	2	1	1	1	-	-	-	-	1	-	1	2	1	-

Recommended by Board of Studies	**28-07-2023**		
Approved by Academic	**1st ACM**	**Date**	**09-09-2023**

23HS221	SOFT SKILLS	L	T	P	C
		0	0	2	1*

COURSE OBJECTIVES:

- To help learners improve their interpersonal skills and critical thinking
- To familiarize learners with the attributes of a leader to enhance team performance
- To prepare students to face job interviews
- To help learners to know the importance of ethics in work place

UNIT I	INTERPERSONAL COMMUNICATION	

Basic communication- verbal and non-verbal communication; passive, assertive and aggressive communication; presentation skills; giving feedback and responding to feedback.

UNIT II	TEAM WORK AND LEADERSHIP	

Vision- setting realistic goals and objectives, collaboration, cooperation, dependability, empathy, sympathy, motivation, delegation of responsibilities, open mindedness, creativity, flexibility, adaptability, cross cultural communication and group dynamics.

UNIT III	TIME MANAGEMENT AND STRESS MANAGEMENT	

Effective Planning, Planning activities at macro and micro levels, setting practical deadlines and realistic limits/targets, punctuality, prioritizing activities, spending the right time on the right activity, positive attitude, emotional intelligence, self- awareness and regulation.

UNIT IV	CRITICAL THINKING AND WORK ETHICS	

Questioning, analysing, inferencing, interpreting, evaluating, solving problems, explaining, self-regulation, open-mindedness, conflict management- ethical dilemmas, appearance, attendance, attitude, character, organizational skills, productivity, respect.

UNIT V	INTERVIEW SKILLS AND RESUME BUILDING TECHNIQUES	
Telephonic interview, online interviews, f2f interviews, FAQ soft skills interview questions, drafting error-free CVs/ Resumes and Cover Letters, selecting the ideal format for resume, content drafting along with sequencing, art of representing one's qualifications and most relevant work history, video resume, website resume.		
TOTAL: PERIODS		

COURSE OUTCOMES:	
After completion of the course, the students will be able to:	
CO1:	Express their thoughts, opinions and ideas confidently to one or more people in spoken form
CO2:	Develop evolving competences required for professional success
CO3:	Demonstrate knowledge and skills in a group as team player and leader
CO4:	Compose a comprehensive resume reflecting qualifications, exposure and achievements
CO5:	Exhibit knowledge and skills confidently during job interviews
CO6:	Demonstrate ethical and professional behaviour at workplace in all situations

TEXT BOOKS:	
1	Soft Skills: Key to Success in Workplace and Life by Meenakshi Raman & Shalini Upadhyay. Cengage

REFERENCES:	
1	English for Job Seekers (Language and Soft Skills for the Aspiring) by Geetha Rajeevan, C.L.N. Prakash) Cambridge University Press pvt, Ltd.
2	Business Benchmark by Norman Whitby. Cambridge University Press pvt, Ltd

Cos	POs												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	-	-	-	-	-	-	-	-	2	2	-	-	-	-	-
2	-	-	-	-	-	2	2	2	3	3	2	2	-	-	2
3	-	-	-	-	-	-	-	-	3	3	-	-	-	-	-
4	-	-	-	-	-	-	-	-	3	3	-	-	-	-	-
5	-	-	-	-	-	-	-	-	3	3	-	-	-	-	-
6	-	-	-	-	-	-	-	3	3	3	-	-	-	-	3
Overall Correlation	-	-	-	-	-	2	2	2	3	3	2	2	-	-	**2**
Recommended by Board of Studies							28-07-2023								
Approved							1st ACM			Date			09-09-2023		

SEMESTER –III

23MA204	PROBABILITY AND STATISTICS	L	T	P	C
		3	1	0	4

COURSE OBJECTIVES:

- To introduce the basic concepts of probability and random variables.
- To introduce the basic concepts of two dimensional random variables.
- To acquaint the knowledge of Estimation Theory for small and large samples this plays an important role in real life problems.
- To provide required advanced statistical tools in solving engineering problems
- To introduce the basic concepts of classifications of statistical quality control this plays very important roles in the field of agricultural engineering

UNIT I	PROBABILITY AND RANDOM VARIABLES	9+3

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 – Curve Fitting- Method of Least Squares-Central limit theorem (for independent and identically distributed random variables, without proof)- Simple problems.

UNIT III	ESTIMATION THEORY	9+3

Unbiased estimators - Efficiency - Consistency - Sufficiency - Robustness - Method of moments - Method of maximum Likelihood - Interval estimation of Means - Differences between means.

UNIT IV	NON- PARAMETRIC TESTS	9+3
Introduction - The Sign test - The Signed - Rank test - Rank - sum tests - The U test - The H test- Tests based on Runs - Test of randomness - The Kolmogorov Tests.		
UNIT V	**STATISTICAL QUALITY CONTROL**	**9+3**
Control charts for measurements ($\bar{x}$ and R charts) – Control charts for attributes (p, c and np charts) – Tolerance limits - Acceptance sampling.		
		TOTAL: 60 PERIODS

COURSE OUTCOMES:	
After completion of the course, the students will be able to:	
CO1:	Apply the fundamental knowledge of the concepts of probability and one dimensional random variables in engineering.
CO2:	Apply standard probability distributions to real life phenomenon.
CO3:	Apply the basic concepts of two dimensional random variables in engineering applications.
CO4:	Apply the concept of estimation theory for small and large samples in real life problems.
CO5:	Apply the notion of sampling distributions and statistical techniques used in engineering and management problems.
CO6:	Apply the basic concepts of classifications of statistical quality control in the field of engineering.
TEXT BOOKS:	
1	Johnson. R.A., Miller. I.R and Freund. J.E, " Miller and Freund's Probability and Statistics for Engineers", Pearson Education, Asia, 9th Edition, 2016.
2	Milton. J. S. and Arnold. J.C., "Introduction to Probability and Statistics", Tata Mc Graw Hill, 4th Edition, 2007.
REFERENCES:	
1	Dr.P. Sivaramakrishna Das, C. Vijayakumari, —A text book of probability and statistics‖, Pearson Publications.

2	Gupta. S.C. and Kapoor. V. K., ―Fundamentals of Mathematical Statistics‖, Sultan Chand & Sons, New Delhi, 12th Edition, 2020.
3	Devore. J.L., "Probability and Statistics for Engineering and the Sciences‖, Cengage Learning, New Delhi, 8th Edition, 2014.
4	Ross. S.M., "Introduction to Probability and Statistics for Engineers and Scientists", 5thEdition, Elsevier, 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	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	-	-

Recommended by Board of Studies	**28-07-2023**		
Approved	**1st ACM**	**Date**	**09-09-2023**

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:	
After completion 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:	Apply the knowledge of normalization theory to normalize 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:	Illustrate distributed, semi-structured and unstructured database systems.

TEXT BOOKS:	
1	Abraham Silberschatz, Henry F. Korth, S. Sudharshan,
2	Ramez Elmasri, Shamkant B. Navathe, "Fundamentals of Database Systems", Seventh Edition, Pearson Education, 2021.
REFERENCES:	
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	1	-	-	1	-	-	-	2	1	1	2	2	1	-
2	3	2	1	1	1	-	-	-	2	1	1	2	3	1	-
3	3	2	1	1	1	-	-	-	2	1	1	2	3	1	-
4	2	1	-	-	-	-	-	-	2	1	1	1	2	-	-
5	2	1	-	-	-	-	-	-	1	1	-	1	2	-	-
6	2	1	-	-	1	-	-	-	-	1	-	2	2	1	-
Overall Correlation	3	2	1	1	1	-	-	-	2	1	1	2	3	1	-

Recommended by Board of Studies	**08-04-2024**		
Approved	**2nd ACM**	**Date**	**25-05-2024**

23AM301	PYTHON PROGRAMMING FOR AI&ML	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To know the basics of Programming.
- To convert an algorithm into a Python program.
- To construct Python programs with control structures.
- To structure a Python Program as a set of functions.
- To use Python data structures-lists, tuples, dictionaries and files.

UNIT I	INTRODUCTION TO PYTHON	9

Introduction to Python Programming: Python Interpreter and Interactive Mode– Variables and Identifiers – Arithmetic Operators – Values and Types – Statements, Reading Input, Print Output, Type Conversions, type() Function and Is Operator, Dynamic and Strongly Typed Language. Control Flow Statements: if, if…else, if…elif…else Decision Control Statements, Nested if Statement, while Loop, for Loop, continue and break Statements.

UNIT II	FUNCTIONS AND STRINGS	9

Functions: Built-In Functions, Commonly Used Modules, Function Definition and Calling the Function, The return Statement and void Function, Scope and Lifetime of Variables, Default Parameters, Keyword Arguments, *args and **kwargs, Command Line Arguments. Strings: Creating and Storing Strings, Basic String Operations, Accessing Characters in String by Index Number, String Slicing and Joining, String Methods, Formatting Strings.

UNIT III	LISTS, TUPLES, DICTIONARIES AND FILES	9

Lists: list operations, list slices, list methods, list loop, mutability, aliasing, cloning lists, list Parameters; Tuples: tuple assignment, tuple as return value; Dictionaries: operations and methods; advanced list processing - list comprehension.

Files and Exception: text files, reading and writing files, format operator.

command line arguments, errors and exceptions, handling exceptions, modules, packages.		
UNIT IV	**NUMPY AND PANDAS**	**9**
Introduction to NumPy, NumPy Arrays, Array Operations, Advanced Array Manipulations Linear Algebra with NumPy, Random Module in NumPy. Introduction to Pandas, Series, DataFrames, DataFrame Operations, Handling Missing Data, Data Transformation, GroupBy and Aggregation, Merging, Joining, and Concatenation, Time Series Data, Data Input and Output, Visualization (Basic)		
UNIT V	**CASE STUDY**	**9**
Applications of AI&ML: Healthcare, Education, Fintech, Retail & E-commerce, Media & Content Creation, Security & Surveillance. Report writing submission on these applications.		
		TOTAL: 45 PERIODS
COURSE OUTCOMES:		
After completion of the course, the students will be able to:		
CO1:	Develop algorithmic solutions to simple computational problems	
CO2:	Develop and execute simple Python programs using Control Statements	
CO3:	Develop simple Python programs for solving problems using Functions and Strings	
CO4:	Build a Python program using lists, tuples, dictionaries and files	
CO5:	Construct a code related to Object-Oriented.	
CO6:	Construct a code related to Functional Programming.	
TEXT BOOKS:		
1	Allen B. Downey, ``Think Python: How to Think Like a Computer Scientist‘‘,2ndedition,UpdatedforPython3,Shroff /O‘ReillyPublishers,2016(http://greenteapress.com/ wp/ think-python/).	

2	Karl Beecher, ―Computational Thinking: A Beginner's Guide to Problem Solving and Programming‖, 1st Edition, BCS Learning & Development Limited, 2017.
REFERENCES:	
1	LearningToProgramwithPython.RichardL.Halterman.Copyright©2011
2	PythonforEverybody,ExploringDataUsingPython3.Dr.CharlesR.Severance. 2016
3	Paul Deitel and Harvey Deitel, ―Python for Programmers‖, Pearson Education, 1st Edition, 2021.
4	G Venkatesh and Madhavan Mukund, ―Computational Thinking: A Primer for Programmers and Data Scientists‖, 1st Edition, Notion Press, 2021.
5	John V Guttag, "Introduction to Computation and Programming Using Python: With Applications to Computational Modeling and Understanding Data__, Third Edition, MIT Press , 2021
6	Eric Matthes, ―Python Crash Course, A Hands - on Project Based Introduction to Programming‖, 2nd Edition, No Starch Press, 2019.
7	https://www.python.org/
8	Martin C. Brown, ―Python: The Complete Reference‖, 4th Edition, Mc-Graw Hill, 2018.

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	1	-
2	3	2	1	1	1	-	-	-	-	-	-	1	3	1	-
3	3	2	1	1	1	-	-	-	-	-	-	1	3	1	-
4	3	2	1	1	1	-	-	-	-	-	-	1	3	1	-
5	3	2	1	1	1	-	-	-	-	-	-	1	3	1	-
6	3	2	1	1	1	-	-	1	1	1	1	1	3	1	1
Overall Correlation	**3**	**2**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**3**	**1**	**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:		
After completion 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
REFERENCES:	
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**

Recommended by Board of Studies	**08-04-2024**		
Approved	**2nd ACM**	**Date**	**25-05-2024**

23AM311	ARTIFICIAL INTELLIGENCE ESSENTIALS	L	T	P	C
		3	0	2	4

COURSE OBJECTIVES:

- Will 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	9

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	9

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	9

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**	**9**
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:**
   a. Write programs to implement various search algorithms like Depth-First Search (DFS), Breadth-First Search (BFS), Uniform Cost Search (UCS), and A* Search.
   b. Test these algorithms on different problem spaces such as simple mazes or the 8-puzzle problem.
2. **Machine Learning Basics:**
   a. Implement simple machine learning algorithms like linear regression or k-nearest neighbors from scratch.
   b. Use libraries like scikit-learn or TensorFlow to implement more complex algorithms like decision trees or neural networks.
3. **Prolog Programming :**
   a. Write a program to implement a basic implementation of sorting a list using Prolog concepts.
   b. Demonstrate its effectiveness on a simple binary tree by

c. Insertion
d. Deletion

4. **Natural Language Processing (NLP):**
    a. Develop a program to perform text classification using techniques like bag-of-words or TF-IDF.
    b. Implement sentiment analysis on a dataset of movie reviews or tweets.
5. **Reinforcement Learning:**
    a. Implement basic reinforcement learning algorithms like Q-learning or SARSA.
    b. Apply them to simple environments like grid worlds or maze navigation problems.
6. **Ontological Engineering:**
    a. Build an inheritance concepts using ontology engineering concepts.
    b. Develop the concepts of ontology integrating of different modules within an enterprise software system to facilitate communication and interoperability.
7. **Computer Vision:**
    a. Use libraries like OpenCV to implement basic computer vision tasks like edge detection or object recognition.
    b. Develop a program to detect faces in images using Haar cascades.
8. **Bayesian Networks:**
    a. Implement algorithms for Bayesian networks such as variable elimination or belief propagation.
    b. Demonstrate their use for probabilistic reasoning in scenarios like medical diagnosis or sensor fusion.
9. **Expert Systems:**
    a. Create a basic expert system using a rule-based approach.
    b. Use it to provide recommendations or solutions in a specific domain like troubleshooting computer problems or diagnosing illnesses.

10. **Game Playing:** a. Develop programs to play classic board games like Tic-Tac-Toe, Connect Four, or Chess. **b.** Implement different strategies such as minimax with alpha-beta pruning for more efficient search.	
TOTAL: 45 +30 =75 PERIODS	
COURSE OUTCOMES:	
After completion of the course, the students will be able to:	
CO1:	Explain the foundational concepts to approach AI problem-solving systematically
CO2:	Apply informed search techniques to optimize problem-solving in various AI scenarios
CO3:	Make use of knowledge representation techniques using logical reasoning, ontological frameworks, and probabilistic models
CO4:	Utilize supervised and statistical learning techniques for predictive modeling and data analysis.
CO5:	Utilize reinforcement learning and algorithms to solve dynamic decision-making problems
CO6:	Experiment with advanced AI techniques and their applications to address real-world problems
TEXT BOOKS:	
1	Stuart Russell and Peter Norvig, "Artificial Intelligence: A Modern Approach", Fourth Edition, Pearson Education, 2022.
REFERENCES:	
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	2	1	-	-	1	-	-	1	-	1	1	1	2	1	1
2	3	2	1	1	1	-	-	1	1	1	1	1	3	1	1
3	3	2	1	1	1	-	-	1	1	1	1	1	3	1	1
4	3	2	1	1	2	-	-	1	1	1	1	1	3	1	1
5	3	2	1	1	1	-	-	1	1	1	1	1	3	1	1
6	3	2	1	1	1	3	-	1	-	1	1	1	3	1	1
Overall Correlation	3	2	1	1	1	1	-	1	1	1	1	1	3	1	1

23AM312	DATA WAREHOUSING AND KNOWLEDGE DISCOVERY	L	T	P	C
		3	0	2	4

COURSE OBJECTIVES:

- To understand the principles of Data warehousing
- Learn basic 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 – 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.		
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 –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		
PRACTICAL EXERCISES: 30 PERIODS		
1. Data exploration and integration with WEKA 2. Apply WEKA tool for data validation 3. Plan architecture for real time application 4. Write the query for schema definition 5. Design data warehouse for real time applications 6. Analyze the dimensional Modeling 7. Case study using OLAP 8. Case study using OTLP 9. Implementation of warehouse testing.		
TOTAL: 45 +30 =75 PERIODS		
COURSE OUTCOMES:		
After completion of the course, the students will be able to:		
CO1:	Infer Data warehousing concepts and Implementation.	
CO2:	Identify the core principles of the mining process.	
CO3:	Utilize association mining principles.	
CO4:	Apply classification mining across diverse applications.	
CO5:	Apply clustering algorithms to a range of datasets.	
CO6:	Infer the utilization of mining across different sectors	

TEXT BOOKS:	
1	Jiawei Han, Jian Pei, Hanghang Tong "Data Mining Concepts and Techniques", Fourth Edition, Elsevier, 2023.
REFERENCES:	
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	2	1	-	-	1	1	1	-	-	-	1	1	2	1	-
2	3	2	1	1	1	-	-	-	-	-	1	-	3	1	-
3	3	2	1	1	1	-	-	-	-	-	1	-	3	1	-
4	3	2	1	1	1	-	-	-	-	-	1	-	3	1	-
5	3	2	1	1	1	-	-	-	-	-	1	-	3	1	-
6	2	1	-	-	1	-	-	1	1	1	1	-	2	1	1
Overall Correlation	3	2	1	2	1	1	1	1	1	1	1	1	3	1	1

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:

After completion 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	3	2	1	1	2	-	-	1	1	1	-	1	3	2	1
2	3	2	1	1	2	-	-	1	1	1	-	1	3	2	1
3	3	2	1	1	2	-	-	1	1	1	-	1	3	2	1
4	3	2	1	1	2	-	-	1	1	1	-	1	3	2	1
5	3	2	1	1	2	-	-	1	1	1	-	1	3	2	1
6	3	2	1	1	2	-	-	1	1	1	-	1	3	2	1
Overall Correlation	3	2	1	1	2	-	-	1	1	1	-	1	3	2	1

Recommended by Board of Studies	**08-04-2024**		
Approved	**2nd ACM**	**Date**	**25-05-2024**

23AM321	PYTHON PROGRAMMING LABORATORY FOR AI&ML	L	T	P	C
		0	0	4	2

COURSE OBJECTIVES:

The main objective of this laboratory is to put into practice computational thinking. The students will be expected to write, compile, run and debug Python programs to demonstrate the usage of:

- Operators and Conditional Statements
- Control Structures and Functions (both recursive and iterative) and Recursion.
- String functions
- Lists, Sets, Dictionaries, Tuples and Files.
- Object-Oriented Programming

Exercise 1	**Programs to demonstrate the usage of operators and conditional statements.**

1. Write a program that takes two integers as command line arguments and prints the sum of two integers.
2. Program to display the information:
   Your name, Full Address, Mobile Number, College Name, Course Subjects
3. Program that reads the URL of a website as input and displays contents of a webpage.

Exercise 2	**Programs to demonstrate usage of control structures.**

4. Program to find the sum of all prime numbers between 1 and 1000.
5. Program to find the product of two matrices.
6. Program to find the roots of a quadratic equation.

Exercise 3	**Programs to demonstrate the usage of Functions and Recursion**

7. Write both recursive and non-recursive functions for the following:
   a. To find GCD of two integers
   b. To find the factorial of positive integer
   c. To print Fibonacci Sequence up to given number n

	d. To convert decimal number to Binary equivalent 8. Program with a function that accepts two arguments: a list and a number n. It should display all the numbers in the list that are greater than the given number n. 9. Program with a function to find how many numbers are divisible by 2, 3,4,5,6 and 7 between 1 to 1000.
Exercise 4	**Programs to demonstrate the usage of String functions.**
	10. Program that accepts two strings S1, S2, and finds whether they are equal are not. 11. Program to count the number of occurrences of characters in each string. 12. Program to find whether a given string is palindrome or not.
Exercise 5	**Programs to demonstrate the usage of lists, sets, dictionaries, tuples and files.**
	13. Simple sorting, Histogram, Students marks statement, Retail bill preparation 14. Write a program that combines lists L1 and L2 into a dictionary. 15. Program to display a list of all unique words in a text file and word count, copy file, Voter's age validation, Marks range validation (0-100).
Exercise 6	**Programs to demonstrate the usage of Object-Oriented Programming**
	16. Program to implement the inheritance. 17. Program to implement polymorphism
	TOTAL: 60 PERIODS
COURSE OUTCOMES:	
After completion of the course, the students will be able to:	
CO1:	Develop algorithmic solutions to simple computational problems.
CO2:	Develop and execute simple Python programs.

CO3:	Construct programs in Python using conditionals and loops for solving problems.
CO4:	Utilize functions to decompose a Python program.
CO5:	Analyse compound data using Python data structures.
CO6:	Interpret data from/to files in Python Programs

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	1	-
2	3	2	1	1	1	-	-	-	-	-	-	1	3	1	-
3	3	2	1	1	1	-	-	-	-	-	-	1	3	1	-
4	3	2	1	1	1	-	-	-	-	-	-	1	3	1	-
5	3	3	2	2	1	-	-	-	-	-	-	1	3	1	-
6	2	1	-	-	1	-	-	1	1	1	1	1	3	1	1
Overall Correlation	**3**	**2**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**3**	**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 will 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	Nancy Duarte "Slide:ology: The Art and Science of Creating Great Presentations" O' Reilly Media.
2	Garr Reynolds "The Naked Presenter: Delivering Powerful Presentations with or Without Slides" New Riders.
REFERENCES:	
1	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	2	2	1	1	-	-	-	1	1	1	-	1	2	2	1
2	2	2	1	1	-	-	-	1	1	1	-	1	2	2	1
3	2	2	1	1	-	-	-	1	1	1	-	1	2	2	1
4	2	2	1	1	-	-	-	1	1	1	-	1	2	2	1
5	2	2	1	1	-	-	-	1	1	1	-	1	2	2	1
6	2	2	1	1	-	-	-	1	1	1	-	1	2	2	1
Overall Correlation	**2**	**2**	**1**	**1**	**-**	**-**	**-**	**1**	**1**	**1**	**-**	**1**	**2**	**2**	**1**

Recommended by Board of Studies	08-04-2024		
Approved	2nd ACM	Date	25-05-2024

SEMESTER –IV

23AM401	FOUNDATION OF SOFTWARE ENGINEERING	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To understand Software Engineering Process and Models.
- To perform software requirements analysis.
- To gain knowledge of the System Analysis and Design concepts using Design and Data flow model.
- To understand software testing and maintenance approaches.
- To work on the software metrics process.

UNIT I	SOFTWARE PROCESS	9

Introduction-The software process-software Engineering Practice-A generic process model-prescriptive process models specialized process models. -Unified process-Personal and Team Process Models –process technology - product and process Agility-Agile Process-Extreme Programming (XP)-Other Agile Process models.

UNIT II	UNDERSTANDING REQUIREMENTS	9

Requirements Engineering -Establishing the Groundwork - Eliciting Requirements -Developing Use Cases - Building the Requirements Model -Negotiating Requirements - Validating Requirements-Requirements Analysis - Scenario-Based Modeling - UML Models That Supplement the Use Case -Data Modeling Concepts- Class-Based Modeling.

UNIT III	DESIGN CONCEPTS AND PRINCIPLES	9

Design within the Context of Software Engineering - The Design Process - Design -The Design Model - Software Architecture - Architectural Genres - Architectural Styles -Architectural Design – Assessing – Alternative Architectural Designs -Architectural Mapping Using Data Flow.

UNIT IV	TESTING	9
A Strategic Approach to Software Testing - Strategic Issues -Test Strategies for Conventional Software - Test Strategies for Object-Oriented Software - Test Strategies for Web Apps - Validation Testing –System- - The Art of Debugging- White Box Testing-Basis Path Testing-Control Structure Testing-Black Box Testing-Model Based Testing-Object Oriented Testing Strategies-Object Oriented Testing Methods-Testing Concepts for Web Apps-The Testing Process.		
UNIT V	**SOFTWARE METRICS**	**9**
The Management Spectrum - The People - The Product - The Process -The WHH Principle - Metrics in the Process and Project Domains - Software Measurement - Metrics for Software Quality - Integrating Metrics within the Software - Metrics for Small Organizations - Establishing a Software Metrics Program - Decomposition - Empirical Estimation Models - Specialized Estimation Techniques -The Make/Buy Decision.		
		TOTAL: 45 PERIODS

COURSE OUTCOMES:	
	After completion of the course, the students will be able to:
CO1:	Compare various Software Development Lifecycle Models.
CO2:	Examine project management approaches as well as cost and schedule estimation strategies.
CO3:	Develop formal analysis on specifications.
CO4:	Make use of UML diagrams for analysis and design.
CO5:	Develop architectural styles and design patterns, and test the system
CO6:	Build relationships among objects.

TEXT BOOKS:	
1	Compare various Software Development Lifecycle Models.
2	Examine project management approaches as well as cost and schedule estimation strategies.

REFERENCES:	
1	Bernd Bruegge and Allen H. Dutoit. "Object-Oriented Software Engineering: Using UML, Patterns and Java.", Third Edition, Pearson Education, 2009.

2	Craig Larman. "Applying UML and Patterns.", 3rd ed, Pearson Education, 2005.
3	Len Bass, Ingo Weber and Liming Zhu. "DevOps: A Software Architect's Perspective.", 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	3	1	3	3	1	-
2	3	3	2	2	1	-	-	-	1	2	1	3	3	2	-
3	3	2	1	1	1	-	-	-	3	1	1	3	3	1	-
4	3	2	1	1	3	-	-	-	3	3	1	2	3	3	-
5	3	2	1	1	3	-	-	-	2	2	1	2	3	2	-
6	2	1	-	-	3	-	-	-	2	2	1	2	3	3	-
Overall Correlation	**3**	**3**	**2**	**2**	**2**	**-**	**-**	**-**	**3**	**3**	**2**	**3**	**3**	**3**	**-**

23AM402	OBJECT ORIENTED PROGRAMMING USING JAVA	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- Understand the concepts of Object-oriented Programming and discuss the important elements of java
- 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	INTRODUCTION AND OPPS CONCEPTS	10

Java Programming- History of Java, comments, 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, arraya, simple java standalone programs, class, object and its methods, constructors and its types, methods, static fields and methods, access control, this reference, overloading methods and constructors, garbage collection, exploring string class.

UNIT II	INHERITANCE, POLYMORPHISM AND PACKAGES	9

Inheritance – Inheritance types, super keyword, preventing inheritance: final classes and methods.

Polymorphism – method overloading and overriding, abstract classes and methods.

Interfaces- Interfaces Vs Abstract classes, defining an interface, implement interfaces, accessing implementations through interface references, extending interface.

Packages- Defining, creating and accessing a package, importing packages.

UNIT III	EXCEPTION HANDLING AND MULTITHREADING	9

Exception handling- Define Exception, advantages 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 sub classes.

Multithreading –Define Thread, multithreading, thread life cycle, creating threads, interrupting threads, thread priorities, synchronizing threads, inter-thread communication.

UNIT IV	GEN.PROG, I/O AND FILES	8

Generic Programming – Generic classes – generic methods. Strings, Input /Output.

Files- Streams- Byte streams, Character streams, Text input/output, Binary input/output, random access file operations, File management using File class.

UNIT V	EVENT DRIVEN PROGRAMMING	9

Applets – Define applets, differences between applets and applications, Life cycle of an applet, Passing parameters to applets.

GUI Programming with Java- The AWT class hierarchy, Introduction to Swing, Swing Vs AWT, 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, Event sources and Listeners, handling button click, Handling Mouse events.

TOTAL: 45 PERIODS

TEXT BOOKS:

1	Java Fundamentals – A Comprehensive Introduction, Herbert Schildt and Dale Skrien, TMH.

2	Core Java: An Integrated Approach – Dr R Nageswara Rao
REFERENCES:	
1	Java for Programmers, P.J.Deitel and H.M.Deitel, PEA (or) Java: How to Program , P.J.Deitel and H.M.Deitel, PHI
2	Object Oriented Programming through Java, P. Radha Krishna, Universities Press.
3	Thinking in Java, Bruce Eckel, PE
4	Programming in Java, S. Malhotra and S. Choudhary, Oxford Universities Press.

23AM403	PRINCIPLES AND PRACTICES OF 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: Clustering, K-means, KNN, Anomaly Detection, Dimensionality reduction, Association Rule Mining, Apriori algorithm.

UNIT IV	NEURAL NETWORKS	9

Perceptron - Multilayer perceptron, activation functions, bias,

variance, overfitting and under fitting – gradient descent optimization – stochastic gradient descent, backpropagation, – Unit saturation (aka the vanishing gradient problem) – hyperparameter tuning, batch normalization, dropout.		
UNIT V	**DESIGN AND ANALYSIS OF MACHINE LEARNING EXPERIMENTS**	**9**
Guidelines for machine learning experiments, regularization - 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:	
After completion of the course, the students will be able to:	
CO1:	Apply the machine learning concepts to solve real-world problems using machine learning algorithms.
CO2:	Extend the fundamentals of machine learning.
CO3:	Examine and implement supervised learning algorithms.
CO4:	Identify ensembling methods and unsupervised learning techniques.
CO5:	Discuss the fundamental understanding of deep learning apply them to simple tasks.
CO6:	Make use of machine learning experiments for various models across different datasets.
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
REFERENCES:	
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	2	1	1	2	-	-	1	1	1	-	2	2	2	1
2	2	1	-	-	1	-	-	1	1	1	-	3	2	1	1
3	3	3	2	2	2	-	-	1	1	1	-	1	2	2	1
4	3	2	1	1	2	-	-	1	1	1	-	3	2	2	1
5	2	1	-	-	1	-	-	1	1	1	-	2	3	1	1
6	3	2	1	1	2	-	-	1	2	2	-	1		2	1
Overall Correlation	**3**	**2**	**1**	**1**	**2**	**-**	**-**	**1**	**2**	**2**	**-**	**2**	**2**	**2**	**1**
Recommended by Board of Studies	**08-04-2024**														
Approved	**2nd ACM**									**Date**			**25-05-2024**		

23AM411	OPERATING SYSTEMS PRINCIPLES	L	T	P	C
		3	0	2	4

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	9

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**	**9**
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		

PRACTICAL EXERCISES:

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 implement various CPU Scheduling Algorithms.
5. Write a C program to simulate the concept of Dining-Philosophers problem.
6. Write a C program to implement inter process communication.
7. Implement a C program to avoid Deadlock using Banker's Algorithm.
8. Write C programs to implement the following Memory Allocation Methods a. First Fit b. Worst Fit c. Best Fit
9. Write C programs to implement the various Page Replacement Algorithms.
10. Implement various disk scheduling algorithms.

COURSE OUTCOMES:

After completion 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 BOOKS:	
1	Abraham Silberschatz, Peter Baer Galvin and Greg Gagne, "Operating System Concepts", 10th Edition, John Wiley and Sons Inc., 2018.
REFERENCES:	
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	3	2	1	1	3	2	1	1	2	2	-	1	3	3	1
2	3	2	1	1	3	2	1	1	2	2	-	1	3	3	1
3	3	2	1	1	3	2	1	1	2	2	-	1	3	3	1
4	3	2	1	1	3	2	1	1	2	2	-	1	3	3	1
5	2	1	-	-	3	2	1	1	2	2	-	1	2	3	1
6	3	2	1	1	3	2	1	1	2	2		1	3	3	1
Overall Correlation	3	2	1	1	3	2	1	1	2	2	-	1	3	3	1

23AM412	AUTOMATA THEORY AND COMPILER ENGINEERING	L	T	P	C
		3	0	2	4

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		
PRACTICAL EXERCISES: 30 PERIODS		
1. Write a LEX Program to scan reserved word & Identifiers of C Language language. 2. Implement Predictive Parsing algorithm 3. Write a C program to generate three address code. 4. Implement SLR(1) Parsing algorithm 5. Design LALR bottom up parser for the given language 6. Write a C program for implementing the functionalities of predictive parser for the mini language specified in Note 1. 7. a) *Write a C program for constructing of LL (1)parsing. b) *Write a C program for constructing recursive descent parsing.		
TOTAL: 45 +30 =75 PERIODS		
COURSE OUTCOMES:		
After completion of the course, the students will be able to:		

CO1:	Build a finite automaton for a specific language.
CO2:	Discuss the regular expressions and its theorems.
CO3:	Identify the basic properties of formal languages and grammars.
CO4:	Examine regular, context-free and recursively enumerable languages.
CO5:	Make use of grammars to produce strings from a specific language.
CO6:	Identify the concepts relating to the theory of computation and computational models.
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
REFERENCES:	
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	3	2	1	1	1	-	-	-	-	-	-	-	2	1	-
2	2	1	-	-	1	-	-	-	-	-	-	-	3	1	-
3	3	2	1	1	1	-	-	-	-	-	-	-	3	1	-
4	3	3	2	2	1	-	-	-	-	-	-	-	3	1	-
5	3	2	1	1	1	-	-	-	-	-	-	-	3	1	-
6	3	2	1	1	1									1	
Overall Correlation	3	2	1	1	1	-	-	-	-	-	-	-	3	1	-

23AM413	BIG DATA COMPUTING AND TOOLS	L	T	P	C
		3	0	2	4

COURSE OBJECTIVES:

- To Understand the Fundamentals of Big Data
- To Explore Big Data Storage Technologies
- To Learn Basics of Hadoop Framework
- To Familiarize with Hadoop Ecosystem Tools
- To Develop Proficiency in MapReduce Programming
- To Integrate Big Data Concepts with Practical Applications

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	BIG DATA TOOLS	9

Hbase – data model and implementations – Hbase examples – Hive- HiveQL queries. Introduction to Spark, Architecture, Data Structure, Introduction to Flink, Architecture, Programming Model.

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

PRACTICAL EXERCISES: 30 PERIODS

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 databases 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

TOTAL: 45 +30 =75 PERIODS

COURSE OUTCOMES:

After completion of the course, the students will be able to:

CO1:	Illustrate big data and use cases from selected business domains.
CO2:	Summarize the concept of NoSQL big data management.
CO3:	Experiment with Hadoop and HDFS to install, configure and run.
CO4:	Utilize Hadoop to solve map-reduce analytics.
CO5:	Utilize Hadoop-related tools such as HBase, Cassandra, Pig, and Hive

CO6:	Utilize and implement the concept of YARN
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.
REFERENCES:	
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.

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	2	1	-	-	1	-	-	-	-	-	-	-	3	1	-
3	3	2	1	1	1	-	-	-	-	-	-	-	3	1	-
4	3	3	2	2	1	-	-	-	-	-	-	-	3	1	-
5	3	2	1	1	1	-	-	-	-	-	-	-	3	1	-
6	3	2	1	1	1									1	
Overall Correlation	3	2	1	1	1	-	-	-	-	-	-	-	3	1	-

23AM421	PRINCIPLES AND PRACTICES OF MACHINE LEARNING LABORATORY	L	T	P	C
		0	0	4	2

COURSE OBJECTIVES:

- To understand the data sets and apply suitable algorithms for selecting the appropriate features for analysis.
- To learn to implement supervised machine learning algorithms on standard datasets and evaluate the performance.
- To experiment the unsupervised machine learning algorithms on standard datasets and evaluate the performance.
- To build the graph based learning models for standard data sets.
- To compare the performance of different ML algorithms and select the suitable one based on the application

LIST OF EXPERIMENTS:

1. Working with Python packages - Numpy, Scipy, Scikit-learn, Matplotlib
2. Loan amount prediction using linear regression and visualize the interpretation
3. Handwritten character recognition using neural networks
4. Classification of Email spam and MNIST data using Support Vector Machines.
5. Predicting Diabetes using decision tree
6. Applications of Random Forest and AdaBoost ensemble techniques
7. K-means and k-Nearest Neighbor clustering for Euclidean distance metric
8. Implementation of Apriori algorithm.
9. Applications of dimensionality reduction techniques on any dataset
10. Mini Project

TOTAL : 60 PERIODS

COURSE OUTCOMES:	
After completion of the course, the students will be able to:	
CO1:	Infer the data sets and apply suitable algorithms for selecting the appropriate features for analysis.
CO2:	Make use of supervised machine learning algorithms on standard datasets and evaluate the performance.
CO3:	Experiment with the unsupervised machine learning algorithms on standard datasets and evaluate the performance.
CO4:	Build the graph based learning models for standard data sets.
CO5:	Compare the performance of different ML algorithms and select the suitable one based on the application.
CO6:	Infer the data sets and apply suitable algorithms for selecting the appropriate features for analysis.

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	2	-	-
2	3	2	1	1	-	-	-	-	-	-	1	-	3	-	-
3	3	2	1	1	-	-	-	-	-	-	1	-	3	-	-
4	3	2	1	1	-	-	-	-	-	-	1	-	3	-	-
5	2	1	-	-	-	-	-	-	-	-	1	-	2	-	-
6	2	1	-	-	1	-	-	1	1	1	1	-	2	1	1
Overall Correlation	3	2	1	1	1	1	1	1	1	1	1	1	3	1	1

23AM422	OBJECT ORIENTED PROGRAMMING USING JAVA LABORATORY	L	T	P	C
		0	0	4	2

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 in JAVA.

EXERCISES

I. 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.

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

5. 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, gross pay, income tax, 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.
6. Write a Java program to create an interface Shape with the get Area () method. Create three classes Rectangle, Circle, and Triangle that implement the Shape interface. Implement the get Area() method for each of the three classes.
7. 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.
8. Write a java program to find the maximum value from the given type of elements using a generic function.

III. The usage of Event Driven Programming

9. Write a java program to draw lines, arcs, figures, images and text in different Fonts, styles and colors.
10. Write a java program to create Frames using swing
11. Design a calculator using event-driven programming paradigm of Java with the following options.
    a) Decimal manipulations
    b) Scientific manipulations
12. 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: 45 PERIODS
COURSE OUTCOMES:	
After completion of the course, the students will be able to:	
CO1:	Demonstrate to Install, configure, and run Hadoop and HDFS.
CO2:	Build applications using NoSQL big data management.
CO3:	Construct map-reduce analytics using Hadoop.
CO4:	Construct map-reduce program with dataset.
CO5:	Utilize Hadoop-related tools such as HBase, Cassandra, Pig, and Hive
CO6:	Develop Big Data Applications

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	-
2	3	2	1	1	2	-	-	-	-	-	-	2	3	2	-
3	3	2	1	1	2	-	-	-	-	-	-	2	3	2	-
4	3	2	1	1	2	-	-	-	-	-	-	2	3	2	-
5	3	2	1	1	2	-	-	-	-	-	-	2	3	2	-
6	3	2	1	1	2	-	-	-	-	-	-	2	3	2	-
Overall Correlation	**3**	**2**	**1**	**1**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**3**	**2**	**-**

23ES491	APTITUDE AND LOGICAL REASONING –1	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:

After completion of the course, the students will be able to:

CO1:	Analyse and solve complex problems, and foster critical thinking and logical reasoning skills.
CO2:	Solve fundamental mathematical problems, and enhance their computational skills and numerical ability.
CO3:	Develop strategies for tackling a variety of problem types, and encourage the use of multiple approaches to solve problems efficiently.
CO4:	Analyse and solve different data analysis problems for time and distance, and interpret data analysis for a case study.
CO5:	Derive information from graphs, and solve questions based on mathematical operations such as ratios, proportions, basic algebra, and statistical estimation.
CO6:	Solve questions in a fraction of a minute using shortcut methods

TEXT BOOK:	
1	Smith, John. "APTIPEDIA." 2nd ed., Wiley Publishers, 2020.
2	Agarwal, R.S. "Quantitative Aptitude." 2nd ed., S. Chand Publishing.
REFERENCES:	
1	Agarwal, R.S. "A Modern Approach to Verbal & Non-Verbal Reasoning." 2nd ed., S. Chand Publishing

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	2	1	2	3	1	-	3
2	2	3	3	-	-	2	-	1	3	2	2	3	2	1	3
3	3	3	3	-	-	2	-	1	2	2	2	3	2	-	3
4	2	3	2	3	-	2	1	2	3	3	2	3	1	2	3
5	3	2	2	-	1	3	-	2	2	3	3	3	3	1	3
6	3	3	3	3	2	3	1	3	3	2	3	3	3	1	3
Overall Correlation	3	3	3	1	1	3	1	2	3	3	3	3	2	1	3

Recommended by Board of Studies	08-04-2024		
Approved	2nd ACM	Date	25-05-2024