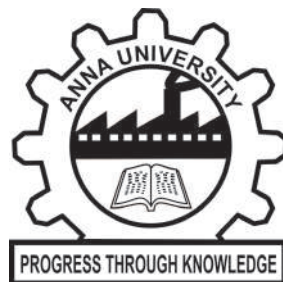


**Regulations
For
Doctor of Philosophy
R 2020**

(As per UGC Regulations 2016)



**ANNA UNIVERSITY
CHENNAI 600 025**

CONTENTS

	Page
DEFINITIONS AND NOMENCLATURE	iv
1 GENERAL ELIGIBILITY	1
2 EDUCATIONAL QUALIFICATIONS	1
3 Ph.D. PROGRAMME	1
4 RESEARCH DEPARTMENT RECOGNITION	3
5 MODE OF SELECTION	5
6 ADMISSION	5
7 SUPERVISOR RECOGNITION	5
8 CHANGE OF SUPERVISOR	7
9 NUMBER OF SCHOLARS	11
10 DURATION OF THE PROGRAMME	11
11 EXTENSION OF MAXIMUM DURATION	11
12 DOCTORAL COMMITTEE	12
13 PROGRAMME STRUCTURE	13
14 RESEARCH OUTSIDE THE UNIVERSITY	14
15 MONITORING THE PROGRESS OF THE SCHOLARS	15
16 SUBMISSION OF SYNOPSIS	15
17 SUBMISSION OF THESIS	17
18 THESIS EVALUATION	17
19 ORAL EXAMINATION	19
20 AWARD OF Ph.D. DEGREE	20
21 CANCELLATION OF REGISTRATION	20
22 PUBLICATION OF THESIS	21
23 THE ACT OF PLAGIARISM	21
24 POWER TO MODIFY	21
RESEARCH CONDUCT RULES	22
GUIDELINES FOR PREPARATION OF SYNOPSIS	24
Annexure I	26
GUIDELINES FOR PREPARATION OF THESIS	28
Annexure II	38
Annexure III	40
Annexure IV	41
Annexure V	42
Annexure VI	43

ANNA UNIVERSITY

REGULATIONS FOR DOCTOR OF PHILOSOPHY

R 2020

DEFINITIONS AND NOMENCLATURE

In the Regulations, unless the context otherwise requires,

- i. "University" means Anna University, Chennai 600 025.
- ii. "Research Board" means the Board duly constituted by the Vice-Chancellor of the University to oversee the academic research activities of the University.
- iii. "Programme" means Doctoral Programme leading to the award of Ph.D. in Engineering / Technology / Science and Humanities / Management Sciences, etc.
- iv. "Chairperson" means Head of the Faculty.
- v. "Supervisor" means any faculty member of the University or outside the University who has been recognized by the University to guide the research scholars.
- vi. "Joint Supervisor" means a recognized Supervisor to guide the scholars in interdisciplinary research that require more than one expert or to take care of the administrative and research responsibilities of the scholar, if the Supervisor retires from service.
- vii. "Head of the Department" means Head of the Department of the Supervisor.
- viii. "Place of research" for the scholars shall be the Department where the Supervisor is working.
- ix. "Doctoral Committee" means a Committee constituted by the University for each scholar to monitor the progress of his/her research work.
- x. "Scholar" means any candidate admitted by the University either under Full-time or Part-time category for pursuing research for the award of Ph.D. degree of the University.
- xi. "Specialization" means the discipline of the Post Graduate Degree Programme such as Environmental Engineering, Applied Electronics, Physics, etc.
- xii. "Course work" means a theory subject of PG programme that is prescribed by the Doctoral Committee for the scholar to undergo as a part of the programme requirement.
- xiii. "Publication" means full length research articles reporting new research findings in respective fields comprise of presentations on new concepts, the development of innovative methods that include figures, tables and references; the results of which have a general impact and contribute to the advancement of the particular field, and are always peer reviewed.

1 GENERAL ELIGIBILITY

- 1.1 Master's Degree of the University or any other qualification recognized as equivalent thereto in the fields of study notified from time to time by the University. Specific educational qualifications are given in Clause 2.
- 1.2 A minimum of 55% marks or CGPA of 5.5 on a 10 point scale in the qualifying examination. In case of SC/ST/ differently –Abled candidates, 50% marks or CGPA of 5.0 on a 10 point scale.

2 EDUCATIONAL QUALIFICATIONS

Programme		Qualification for Admission
(i)	Ph.D. Degree in Engineering/ Technology	M.E. / M.Tech. / M.Pharm. / M.S. (By Research) in the relevant branch of Engineering or Technology
(ii)	Ph.D. Degree in Science and Humanities	M.Sc. / M.S. (By Research) in the relevant branch of Science and Humanities / M.C.A/ M.A. (English/ Communication/ Mass Communication/ Journalism/ Media Arts)
(iii)	Ph.D. Degree in Management Sciences	MBA / Post Graduate Diploma in Business Management or Administration awarded by Indian Institute of Management (IIM) / M.S. (By Research) in Management Sciences / CA/ICWA
(iv)	Ph.D. Degree in Architecture and Planning	M.Arch. / M.Plan. / M.S. (By Research) in Architecture and Planning

3 Ph.D. PROGRAMME

Two categories of Ph.D. programme available are: Full-time and Part-time. Candidates who satisfy the eligibility criteria as in Clauses 1 & 2 are eligible to apply for Ph.D. Programme.

3.1 Full-time Ph.D. Programme

- 3.1.1 Candidates under Full-time shall do research work in the University Departments / University Colleges / Colleges affiliated to the University which are approved research departments of the Colleges should be available during the working hours for curricular and related activities.
- 3.1.2 Candidates who clear the selection criteria of the Ph.D. admission of the University and working in the projects undertaken from State / Central / Quasi Government

and fully funded projects in the University Departments / University Colleges / Colleges affiliated to the University shall register for the research programme under the supervision of the Principal Coordinator / Investigator of such projects. Such supervisors should be regular teaching faculty as well as recognized supervisors of this University. The scholar should be appointed in a project sanctioned by a funding agency/organization atleast for a period of two years. Part employments in different spells or in different projects are not permitted. The Department/ Centre where the project is undertaken should be the recognized research centre of the University and also the working place of the Scholar.

- 3.1.3 Candidates in employment, who want to pursue Full-time study, should be sponsored by their employer and should avail leave for the minimum duration of the programme (Clause 10) and should get formally relieved from their duty to join the research programme.
- 3.1.4 Candidates who are sponsored by AICTE under Quality Improvement Programme for teachers of Engineering Colleges and who satisfy the eligibility conditions shall apply for Full-time category only, in the Specializations as notified in the AICTE guidelines.
- 3.1.5 Candidates who are selected at National level Fellowship programmes or by any recognized bodies and who satisfy the eligibility conditions as per the regulations shall apply for Full-time category in the respective Specialization.
- 3.1.6 Foreign Nationals sponsored by the Government of India or their respective Government on any exchange programme and who satisfy the eligibility conditions as per the regulations shall apply for Full-time category in the respective Specialization.
- 3.1.7 Full-time scholars shall necessarily sign in the attendance register on all working days at the respective place of research.

3.2 Part-Time Ph.D. Programme

The following categories of candidates are eligible to apply under Part-time programme:

3.2.1 Part Time Internal Scholars

Full-time teaching faculty of University Departments / University Colleges and regular teaching faculty of Government Engineering Colleges / Government aided Engineering Colleges / Government Polytechnic Colleges / Government aided Polytechnic Colleges. The nomenclature shall continue for the above scholars till they are in service in the above Institutions.

3.2.2 Part Time External Scholars

- i. Full time teaching faculty of Self financing Engineering colleges affiliated to the University / Self-financing Polytechnic Colleges within Tamil Nadu.
- ii. Candidates working in Industrial Units / R&D Departments / National Laboratories / Units of Government / Quasi Government or any other research laboratories within Tamil Nadu, which are recognized by the University to do research with the University and sponsored by the respective employer.

The nomenclature shall continue for the above scholars till they are in service in the above Institutions.

- 3.2.3 The place of research of the Scholar mentioned in the clauses 3.2.1 and 3.2.2 shall be the working place of the Supervisor.

3.3 Change of Category

The change of category shall be approved by the Director (Research) only once during the tenure, subject to submission of necessary documents along with the recommendation of the Supervisor and Head of the Department /Director of the Centre of the Supervisor and the Scholar. Change of category more than once may be considered only under extraordinary circumstances, if deemed fit reasons. Change of Category is permitted only for the scholars who had completed the confirmed registration. In case of change of category from Full-time to Part-time or Vice-Versa, the minimum period shall be accounted as whichever is high.

4 RESEARCH DEPARTMENT RECOGNITION

“The following organizations are eligible to apply for Department/Institute recognition to do research with Anna University”

- i. All Departments of Government / Government Aided Engineering Colleges / University Colleges.
- ii. Departments of Engineering Colleges affiliated to the University.
- iii. Industrial Units /R&D Departments / National Laboratories / Units of Government / Quasi Government located within Tamilnadu.

4.1 Norms for Research Department Recognition

- i. The Engineering College or Organizations should have atleast 5 years of standing.
- ii. The Engineering College shall offer P.G. programme in the Department concerned

with a minimum of five years standing (with the exception of Mathematics/ Physics/ Chemistry/ Humanities Departments).

- iii. Minimum of two regular teaching faculty members with Ph.D. degree in the core specialization should be available in the Department concerned. Each regular teaching faculty member should be a recognized Supervisor of this University and having a minimum of one year working experience in the Department concerned of the same Institute / College.
- iv. Minimum of two regular employees with Ph.D. degree from recognized institution in respective specialization and having a minimum of three years of experience in the same R&D Centre of Industry (within Tamilnadu) should be available in the Department concerned.
- v. Sufficient infrastructure facilities as specified by the University in the relevant area of research.
- vi. On fulfilling the norms on the availability and suitability of infrastructure facilities for research as specified by the University and based on the satisfactory assessment report by the Inspection Committee, the Department/R&D Centres of Industries shall be recognized as research centre for a period of Three years (Five years for R&D centres of State / National laboratories).

4.2 Norms for Renewal of Research Department Recognition

- i. The Research Department should satisfy the item 3 of Clause 4.1.
- ii. The Research Department shall renew their recognition periodically by the concerned institution by fulfilling the norms specified by the University to continue as a recognized Research Department / R&D centre before 3 months prior to the expiry of the current term. If it is not renewed within the stipulated period, the recognition stands cancelled automatically without any prior information.
- iii. Based on the application and subsequent scrutiny, the renewal session shall be adopted as follows:
 - a. Three years for Engineering Colleges and R&D centres of Industries located in Tamilnadu.
 - b. Five years for R&D centres of State / National laboratories located in Tamilnadu.

5 MODE OF SELECTION

- 5.1 The candidates desirous of registering for Ph.D. Programme shall apply by filling all the relevant details mentioned in the online application form available in the University website and submit online with the approval of the supervisor on or before the due date as indicated in the notification issued from time to time. University shall issue notification for Ph.D. admission twice every year.
- 5.2 Incomplete applications and applications with false information in any respect shall be summarily rejected without any intimation to the candidate.
- 5.3 The Centre for Research shall screen the applications as per the eligibility norms, and the Centre for Entrance Examinations shall conduct the written test for eligible candidates. **Candidates appearing for the written test should obtain minimum marks as specified by the University to qualify for the interview process.** *The final selection of the candidate for the Ph.D. admission shall be based on the overall marks secured by the candidate in the Written test, Qualifying examination (PG Degree) and Interview. The successful candidates selected for Ph.D. admission shall be shortlisted based on the cut-off marks fixed by the Research Board.*

6 ADMISSION

- 6.1 The selected candidate shall be admitted for the Ph.D. programme in the respective Faculty based on his/her PG qualification. The Research Board constituted by the Vice-Chancellor shall approve and recommend the short listed candidates for admission to the Ph.D. programme in the appropriate specialization, after giving due consideration to the interdisciplinary fields of research (if any).
- 6.2 The session of provisional registration for the Ph.D. programme shall be either January or July of the year in which the candidate is admitted.
- 6.3 The selected candidates shall be provisionally registered for Ph.D. programme either in the current session in which the candidate is selected or in the subsequent session, failing of which will lead to the cancellation of the candidature.
- 6.4 The Scholar, Supervisor, Joint Supervisor, Doctoral Committee members and Examiners shall not be relatives to one another.

7 SUPERVISOR RECOGNITION

- 7.1 The applicant should possess Ph.D. degree in the relevant area of research in which

he/she has carried out the research and the supervisorship will be awarded in the same faculty in which his/her Ph.D. degree is awarded.

7.2 The regular Full-time teaching faculty in the University Departments / University Colleges / Colleges affiliated to the University and Full time Scientists of State / National Laboratories of Government of India located within the Tamil Nadu are eligible to apply for Supervisorship.

7.3 The applicant should have research publications in the regular issue of List of Journals (as given in the Centre for Research website at the time of submission of the application) as detailed below:

- 1) Regular Full time Professor shall have atleast five publications to his/her credit.
- 2) Regular Full time Associate Professor shall have atleast three publications to his/her credit.
- 3) Regular Full time Assistant Professor shall have atleast two publications to his/her credit.
- 4) Publications produced during the Ph.D. programme and after the completion of the Ph.D. programme shall be considered for processing the application.
- 5) Among the number of papers mentioned, atleast one of the paper should be Communicated and published after the completion of his / her Ph.D programme.

Applicant shall be the first/second author (in case if his/her Student/ Supervisor is the first author) and the corresponding author in the publications. The credit of the published paper will be granted to only one of the authors for awarding the supervisorship. The published paper content should be in the relevant area of research of the applicant and within the scope of the Journal. If self-plagiarism / plagiarism is ascertained in the publications of the applicant, the application will be summarily rejected and the applicant will not be permitted to apply for Supervisorship for the next two years.

7.4 The applicant who fulfills the norms will be recognized as supervisor based on the recommendation of the Faculty Chairperson concerned and approval of the Research Board.

7.5 Supervisors working in the non – recognized research Departments of affiliated Engineering Colleges/ Architecture Schools situated within Tamil Nadu shall function only as **Joint Supervisor**.

- 7.6 Supervisors working in recognized Nationalized Laboratories situated within Tamil Nadu shall also function as Supervisor. However, a recognized supervisor from University Departments/ University Colleges/ Affiliated Engineering Colleges is mandatory to act as Joint Supervisor to take care of the administrative and research responsibilities of the scholar.
- 7.7 For interdisciplinary research that requires more than one expert, the Joint Supervisor from other Departments/Institutions shall be approved by the Director (Research) based on the request of the Supervisor and the recommendation of the Head of the Department of the Supervisor.
- 7.8 A Supervisor shall entertain registration of new scholars under his/her supervision up to the age of 58 years.
- 7.9 Communication in any form with the Thesis examiners by the Supervisor/Joint Supervisor/Scholar after the submission of Synopsis/Thesis of the scholar in connection with the evaluation report shall lead to the withdrawal of the supervisorship for a period of five years and they shall be debarred from guiding the existing scholars in the University till such period.
- 7.10 The recognized Supervisors of this University shall not obtain supervisorship status from any other University. However, the recognized Supervisors can function as Joint Supervisor for scholars working in association with other reputed Universities which have MoU with Anna University.
- 7.11 Any violation of Ph.D. regulations by the Supervisor/Joint Supervisor shall lead to the withdrawal of the supervisorship either permanently or for a maximum period of five years and they shall be debarred from guiding the existing scholars in the University till such period.

8 CHANGE OF SUPERVISOR

- 8.1 When a Supervisor of a scholar happens to be away from the University Departments/ University Colleges/ Affiliated Engineering Colleges/ National Laboratories for more than six months and up to maximum of one year, he/she shall continue to guide the scholar, but a Supervisor-in-charge (recognized Supervisor of the University) shall be nominated by the Director (Research) based on the request of the Supervisor and / or the recommendation of the Head of the Department of the Supervisor to take care of the administrative responsibilities of the Scholar. The nominated faculty shall continue as Supervisor-in-charge until Supervisor returns or to a maximum period of one year. Under extraordinary circumstances, if the Supervisor of a scholar happens to be

away from the University Departments/ University Colleges/ Affiliated Engineering Colleges/ National Laboratories for more than one year, either the supervisor-in-charge may be nominated as the Supervisor or an alternate supervisor shall be nominated by the Director (Research) based on the request of the Supervisor-in-Charge and the recommendation of the Head of the Department.

8.2 When a Supervisor of a scholar happens to be away from the University for more than one year, an alternate Supervisor shall be nominated by the Director (Research) based on the request of the Supervisor and / or the recommendation of the Head of the Department of the Supervisor.

8.3 The Supervisor who retires from service shall continue to guide a scholar already registered under his/her guidance, provided the provisional registration of the scholar is confirmed, and the scholar submits the Thesis within one year from the date of his/her superannuation / leaves service based on his/her written request. If the scholar has not submitted the thesis within one year, a Joint Supervisor shall be nominated by the Director (Research) based on the request of the Supervisor and/or the recommendation of the Head of the Department of the Supervisor.

8.4 When a Supervisor migrates to other University, such Supervisor's recognition will be cancelled. If some of the scholars had submitted their synopsis or thesis under their guideship, supervisors shall be permitted to continue to guide those scholars to complete their research programme provided the scholar submits the Thesis within one year from the date of migration of the Supervisor. A Research Coordinator is to be allocated for those Scholar(s) to discharge the following responsibility to

(a) arrange the Doctoral Committee meetings.

(b) facilitate the scholar in preparing the synopsis and thesis

(c) conduct the Viva-Voce examination

The Research Coordinator is not entitled to take the credit of the Ph.D degree of such scholar(s).

In all other cases, an alternate Supervisor shall be nominated by the Director (Research) based on the request of the Supervisor and the recommendation of the Head of the Department of the Supervisor.

8.5 When a Supervisor migrates to non-recognized department of the University, and their scholar(s) had submitted their synopsis or thesis under their guideship, a Research Coordinator is to be allocated to the Scholar(s) to discharge the following responsibility to

- (a) arrange the Doctoral Committee meetings.
- (b) facilitate the scholar in preparing the synopsis and thesis
- (c) conduct the Viva-Voce examination

The Research Coordinator is not entitled to take the credit of the Ph.D. degree of such scholar(s).

In all other cases such supervisors shall continue to guide those scholars as a Joint supervisor only and a Supervisor from a recognized department of the University shall be nominated by the Director (Research) based on the request of the previous Supervisor (present Joint supervisor) with the recommendation of the Head of the Department of the Supervisor to take care of the administrative and research responsibilities of the scholar.

- 8.6 If the Institution in which the scholar works becomes Private University / College, such scholar shall be permitted to continue their research work in the University / College and to submit the Thesis under the same Supervisor with the approval from the Director (Research), provided his/her provisional registration is confirmed. Otherwise their registration shall be cancelled.
- 8.7 If the scholar migrates to other University / Institution / Public sector organization, such scholar shall be permitted to continue the research work in the University and permit to submit the thesis under the same Supervisor with the approval from the Director (Research), provided his/her provisional registration is confirmed. In all other cases, the registration of such scholar shall stand cancelled.
- 8.8 If the Institution(s) affiliated to the University becomes Private University, then the recognized Supervisors working in such institutions shall not be permitted to guide the scholars and their recognition shall be cancelled. If some of the scholars have their provisional registration confirmed, such scholars shall be permitted to continue their research under such supervisor's guideship till the completion of their research. However a Joint Supervisor shall be nominated by the Director (Research) based on the request of the Supervisor to take care of the administrative and research responsibilities of the scholar.
- 8.9 Change of Supervisor for a research scholar shall be possible on valid reasons within the maximum period (clause 10.7) from the date of registration with the consent of both the present and proposed Supervisors. In case, the scholar requests for change of Supervisor without the consent of the Supervisor, the request shall be considered

based on the recommendation of the Committee constituted by the Vice-Chancellor. In such cases, the committee's decision is final. If change of Supervisor is approved, the scholar has to work for a minimum of one year with the new Supervisor and Synopsis shall be accepted only when the scholar has published atleast one journal publication (as applicable) with new Supervisor.

8.9.1 The change of Supervisor can be done only once during the entire duration of the program. Under extraordinary circumstances, further change in Supervisor will be approved based on the recommendations from the Vice Chancellor.

8.10 If a supervisor deceased after the submission of thesis by his / her scholar, a Research Coordinator shall be nominated by the Director (Research) based on the recommendation from the Head of the Department of the supervisor to discharge the following responsibility

(1) To arrange the Doctoral Committee meeting

(2) If one examiner recommends the thesis with a condition defined in the Ph.D Regulations 2020 clause 18.2.3 :

“Defer the recommendation at this stage and the scholar shall incorporate the suggested modifications in the Thesis and the corrected Thesis along with the scholar’s clarifications shall be sent to the respective examiner” and “other examiner reject the thesis” as per the Ph.D Regulations 2020 clause 18.3.2 :

“ If one examiner recommends the award of the degree while the other recommends rejection, then the Thesis shall be referred to the third examiner to be nominated by the Vice-Chancellor as in Clause 18.1. If two of the three examiners recommend the award, the Thesis shall be provisionally accepted. If two of the examiners recommend rejection, the Thesis shall be rejected and the registration of the scholar shall stand cancelled “.

If the examiners suggested for correction in the thesis, the Research Coordinator shall guide the scholar to bring out desired Research outcomes as recommended by the Examiners.

In such conditions, considering the contributions made by the Research Coordinator, he / she shall be re-designated as **“Additional Supervisor”**

(3) To conduct the Viva-Voce examination

9 NUMBER OF SCHOLARS

- 9.1 The Professor who is a Supervisor shall guide only a maximum of **11** (Ph.D./M.S. (By Research) put together) scholars as Supervisor/Joint Supervisor at any time. The Associate Professor who is a Supervisor shall guide only a maximum of **8** scholars and an Assistant Professor shall guide only a maximum of **5** scholars as Supervisor/Joint Supervisor at any time.

10 DURATION OF THE PROGRAMME

- 10.1 The duration of the programme and the time for submission of Thesis are counted from the date of provisional registration.
- 10.2 The minimum duration of the programme in Engineering, Technology, Architecture and Planning, Agriculture, Medicine and allied programmes for Full-time/Part-time shall be two/three years respectively.
- 10.3 The minimum duration of the programme in Science & Humanities for **Full-time/Part-time** shall be **three / four** years respectively.
- 10.4 The minimum duration of the programme in Management Science for Full-time/Part-time shall be as in Clauses 10.2 / 10.3 for scholars with Engineering and Technology / Science and Humanities background respectively.
- 10.5 The Director (Research) shall permit, if deemed fit for reasons, break of study for the scholar under extraordinary circumstances such as medical grounds and other compelling reasons which warrants his/her absence to the programme. However, the break of study period shall not be counted for the minimum duration of the programme.
- 10.6 Break of study to scholars shall be granted upto a maximum period of **one year**. Such request with the recommendation of the Supervisor and Head of the Department should reach the Director (Research) prior to availing the break of study. If prior permission is not sought and obtained, it will be considered as a case of discontinuation and action will be taken to cancel the registration of such scholars. Break of study period will be counted for the maximum duration of the programme (Clause 10.7). The scholar should remit the semester fees during the break of study period.
- 10.7 The maximum duration for the programme shall be six years for full time and part time scholars of all the faculty streams.

11 EXTENSION OF MAXIMUM DURATION

- 11.1 Scholars who do not submit the thesis within the maximum duration of the programme (six years) shall apply for extension of time three months prior to the completion of

six years with the recommendation of the Supervisor. In such cases, a maximum grace period of one year, beyond the normal maximum period of six years shall be granted by the Director (Research) to enable the scholar to submit the Synopsis and Thesis. However, the final six months grace period shall be granted by the Vice-Chancellor only if the scholars submit the **synopsis** and apply for extension with the recommendation of the Supervisor, atleast one month prior to the expiry of the previous extension. Double the semester fees as prescribed from time to time shall be paid beyond the maximum duration.

- 11.2 If the scholar fails to submit the Thesis within the extended period of One and half years, the registration shall be cancelled and the name will be removed from the rolls.

12 DOCTORAL COMMITTEE

- 12.1 There shall be a Doctoral Committee for every scholar to monitor the progress of research work.

- 12.2 For every scholar, the Supervisor shall furnish 2 panels of 3 each with doctoral qualification in the field of proposed research, from the faculty members of (a) University and Colleges affiliated to the University (b) other Universities / experts from R&D Departments / National Laboratories or any other research laboratories, from which two experts, one from each panel will be nominated as Doctoral Committee members preferably within the state by the concerned Faculty Chairperson.

- 12.3 The Supervisor of the scholar shall be the convener of the Doctoral Committee.

- 12.4 The Joint Supervisor, if applicable, should also be a member of the Doctoral Committee.

- 12.5 The Head of the Department /Director of the Centre shall forward the Doctoral Committee minutes to the Director (Research). However, the meetings of Doctoral Committee should be informed to the Director (Research) with a copy to Head of the Department /Director of the Centre well in advance. The minutes of the doctoral committee will be approved by the Centre only if the prior information received at the Centre at least three days before the doctoral committee.

- 12.6 The Director (Research) shall permit, if deemed fit reasons, Change of Doctoral Committee member for the scholar based on the request of the supervisor under the following circumstances such as :

- i Topic of research changed before confirmation of the Provisional Registration.
- ii Doctoral Committee member is away from the place of work for more than 2 years.

- iii Doctoral Committee member is deceased.
- iv. Member not responding to attend Doctoral Committee meetings.

In all the above cases or any other compelling reasons, the Chairperson of the Faculty shall nominate an alternate Doctoral Committee member from the panel furnished by the Supervisor.

13 PROGRAMME STRUCTURE

13.1 Course Work

- 13.1.1 The Doctoral Committee of a scholar shall meet within three weeks from the date of communication of his/her provisional registration to prescribe the course works relevant to the research.
- 13.1.2 A **minimum of four course works** of 12 Credits relevant to the area of research and offered under any approved PG programme of the University shall be recommended by the Doctoral Committee. But the scholars shall not have undergone such course works in their PG programme /M.S. (By Research).
- 13.1.3 Only course works registered after the first Doctoral Committee meeting shall be counted towards this requirement. Any course work already passed by the scholar prior to provisional registration shall not be counted for this purpose.
- 13.1.4 The scholar shall attend classes along with PG students and will be evaluated in the same relative grading scale of the course work.
- 13.1.5 No change in the course works prescribed shall be made without the approval of the Doctoral Committee and if any change, the same should be informed to the Centre in advance.
- 13.1.6 The prescribed course works shall normally be completed within two years from the date of provisional registration for both Full-time and Part-time scholars. Maximum two attempts are permitted for the scholar to pass the subject for both the part time and full time scholars and the courses should be completed within three years from the date of Provisional Registration. If the scholar fails to complete the confirmation of provisional registration within three years after his/her registration for the Ph.D. programme, the registration of the scholar shall stand cancelled.
- 13.1.7 Regularly offered PG electives shall not be taken as Special Elective and the scholar shall wait to undertake such course work when it is offered to the PG students in the Department.

13.1.8 The scholars shall secure a **CGPA of 7.0 in the course works** in order to become eligible for comprehension examination. The scholar who fails to secure a CGPA of 7.0, he/she shall undertake one more course work relevant to the area of research offered under any approved PG programme of the University with the recommendation of the Doctoral Committee or write the arrear examination (only once) from any one/two of the course works undertaken, to improve the CGPA to 7.0 (Best four course works shall be considered, if additional course work is undertaken). A pass in the Comprehensive Examination is required for provisional confirmation of Ph.D. registration.

13.2 Comprehensive Examination

13.2.1 On the successful completion of the prescribed course works, as evidenced by the grade sheet issued by the Controller of Examinations, the Doctoral Committee shall conduct a Comprehensive (written and oral) Examination for every scholar to test the background knowledge of the scholar in the area of specialization within 6 months from the date on which the results of all the prescribed course work are declared. The Comprehensive Examination shall cover the topics in the specialization and allied areas. The result of the Comprehensive examination and the results of the course works shall be detailed in the minutes of the Doctoral Committee and forwarded to the Director (Research), for confirmation of the provisional registration and to proceed further with his/her research work, within two months from the date of the Comprehensive Examination held.

13.2.2 If the performance of the scholar is not approved by the Doctoral Committee based on the results of Comprehension Examination, a grace period of three months (within the maximum period of three years) shall be given and then at the end of which the scholar shall be re-examined. If found fit, the scholar is provisionally confirmed and is permitted to proceed further with his/her research work. Otherwise the provisional registration granted to the scholar shall be cancelled.

14 RESEARCH OUTSIDE THE UNIVERSITY

14.1 The scholar shall be permitted to carry out his / her research in an Institute / Project (relevant to research area) outside the University for a maximum period of one year only after the confirmation of the Registration. Such request from the scholar shall be approved by the Director (Research) only if the same has been recommended by the Supervisor and forwarded by the Head of the Department of the Supervisor.

14.2 The scholars shall be permitted to do research outside the University on related fellowship programmes for a period upto one year, with prior approval from the Director (Research) only after the confirmation of the registration.

- 14.3 The scholars who carried out research outside the University shall submit the Synopsis only after a minimum period of one month on his/her return. The papers published during such period of outside assignment should be relevant to the area of research and should carry the scholar as first author and corresponding author.
- 14.4 The registration of a scholar continuing his/her research outside the University beyond the approved period shall stand cancelled automatically.

15 MONITORING THE PROGRESS OF THE SCHOLAR

- 15.1 Commencing from the date of provisional registration till the submission of thesis, all research scholars shall submit the progress report and registration renewal form in the prescribed format duly signed by the Supervisor and Head of the Department of the Supervisor and Head of the Department of the Part Time Scholar atleast three weeks before the end of every semester, without which the scholars shall not be permitted to pay the semester fee.
- 15.2 One Seminar presentation shall be given by the scholar before the confirmation of the provisional registration and another presentation prior to the submission of synopsis. Prior information should be passed on to the Centre. Both Seminars shall be open to faculty members and research scholars and should be conducted at the working place of the supervisor.
- 15.3 After the confirmation of provisional registration, the progress made by the research scholars shall be reviewed by the Doctoral Committee once a year.
- 15.4 Full-time research scholars shall sign the attendance register in the Department of the Supervisor on all working days and copy of the same attested by the Head of the Department should be submitted at the Centre along with the progress report. They are eligible for a total of 15 days leave every semester and a maximum of 30 days in a calendar year, which they shall avail after obtaining permission from the Supervisor and Head of the Department. However, those scholars who are availing financial assistance from funding agency shall be governed by the rules of the respective agency. The part time scholars should meet their respective supervisors atleast once in a month.

16 SUBMISSION OF SYNOPSIS

- 16.1 The scholar shall be permitted to submit the Synopsis only after obtaining the confirmation of provisional registration and completion of the minimum duration of the programme applicable to the scholar. However, a scholar shall be permitted to submit the Synopsis (after obtaining confirmation) three months prior to the completion of his/her minimum duration, provided the scholar has published two research articles (and the journal concerned) in the regular issue of the referred impact factor journals

in the field of specialization as first author or second author (if the Supervisor is first author) based on his/her research work and specifically recommended by the Doctoral Committee. The content of the published paper should be within the scope of the Journal. Publications of the scholars where a UG / PG student is a corresponding author / First author shall not be considered for processing of his/her Synopsis.

- 16.2 The Synopsis will be accepted only when the scholar has published atleast one research article (in the regular issue of the journal concerned) after joining the Ph.D. programme in the regular issue of the referred impact factor Journals in the field of specialization based on his/her research work as first author or second author (if the Supervisor is first author) or one patent granted based on his/her research work. The filing date of the patent should be after the date of provisional registration of the Ph.D. Programme. The corresponding author shall be either scholar or supervisor or joint supervisor. In Journal paper, the maximum number of authors is limited to Four. Publications of the scholars where a PG student is a corresponding author shall not be considered for processing of his/her Synopsis. The scholar shall not publish research articles with similar contents in part or full in more than one journal, which would result in Self Plagiarism.
- 16.3 The scholar shall submit the synopsis at the Centre only if he/she had completed the confirmed registration and possess one journal publication as mentioned in Clause 16.2.
- 16.4 The synopsis shall be accepted at the Centre only if the Doctoral Committee approves the quality and quantity of research that appears in the final thesis is sufficient for further examination of the thesis.
- 16.5 The scholar shall submit a copy of the Synopsis of his/her research work prepared in accordance with the format and specification prescribed, to the Doctoral Committee through the Supervisor and Joint Supervisor (if applicable) at the time of Doctoral Committee meeting. At the time of the Synopsis approval meeting of the doctoral committee, the scholar should produce the completed first draft of the thesis.
- 16.6 If the Doctoral Committee approves the research work reported in the Synopsis and fulfils Clause 15.2, the approved Synopsis shall be submitted to the Director (Research) along with a panel of twelve examiners at the level of Associate Professor and above / equivalent scientist grade with minimum five years of post Ph.D. experience with fairly good publication record (H index). Out of the twelve examiners, at least six examiners should be from IISc / IITs / ISER / NITs / State Universities / Central Universities and reputed State / Central Laboratories and the remaining six examiners should be from reputed institutions abroad.

17 SUBMISSION OF THESIS

- 17.1 The Thesis shall report, in an organized and scholarly fashion, an account of original research work of the scholar leading to the discovery of new facts or techniques or correlation of facts already known (analytical, experimental, hardware oriented, etc.) and demonstrating a quality contribution to the advancement of knowledge as well as the scholar's ability to undertake sustained research.
- 17.2 Thesis shall be prepared in accordance with the prescribed format and specification. One copy of thesis in PDF format (to be uploaded) and a hard copy shall be submitted only after the acceptance of Synopsis and within three months from the date of approval of the Synopsis by the Doctoral Committee along with one hard copy of the abstract of the Thesis each in English and Tamil (in about 400 words). Under extraordinary circumstances, submission of Thesis shall be permitted up to a maximum period of six months, with prior approval from the Director (Research). In such cases, the late fee shall be paid as applicable.
- 17.3 The Thesis shall include a Certificate from the scholar, Supervisor and Joint Supervisor (if applicable) as prescribed, to the effect that the Thesis is a record of original research work carried out by the scholar and the work reported in the thesis is not copied from other sources/ not submitted elsewhere for a degree or diploma.
- 17.4 The Thesis shall be scrutinized to assess the overall layout, contents and the quality of presentation of the Thesis. The deviation, if any, shall be rectified by the scholar in consultation with the Supervisor and the same shall be approved by the Director (Research) and three copies of the corrected thesis shall be submitted. Soft copy of the thesis, abstract of the Thesis in English and Tamil shall be uploaded in the University website.
- 17.5 Fees shall be paid by the scholars for every semester during the notified period till the submission of the Thesis. Any other fees as applicable shall be paid as notified from time to time.

18 THESIS EVALUATION

- 18.1 The Thesis shall be referred to two examiners (one from India and another from abroad) nominated by the Vice-Chancellor from the panel of examiners recommended by the Doctoral Committee. The Vice-Chancellor if deems it necessary may also nominate the examiners from outside the panel.
- 18.2 The examiner shall include in his/her report an overall assessment placing the Thesis in any one of the following categories.

- 18.2.1 Recommend the acceptance of the Thesis in the present form.
- 18.2.2 Recommend the acceptance of the Thesis. However, the scholar shall incorporate the corrections indicated in the detailed report and place the corrected copy to the Oral Examination Board but the corrected Thesis need not be sent to the examiner.
- 18.2.3 Defer the recommendation at this stage and the scholar shall incorporate the suggested modifications in the Thesis and the corrected Thesis along with the scholar's clarifications shall be sent to the respective examiner.
- 18.2.4 Reject the Thesis for the reasons set out in the detailed report.
- 18.2.5 The examiner shall also enclose a detailed report, indicating the standard attained in the case of 18.2.1, the nature of revision in the case of 18.2.2 & 18.2.3 and specific reasons in the case of 18.2.4.
- 18.3 If both the examiners recommended for the award of the degree, Thesis shall be provisionally accepted. Any minor revision, modification, etc., suggested by the examiners shall be carried out before the Oral Examination Board.
 - 18.3.1 If any examiner recommends resubmission of the thesis after revision as per Clause 18.2.3, the scholar shall be permitted to revise and resubmit the Thesis along with the resubmission fee within six months, failing which the revised thesis shall not be accepted and his/her registration shall stand cancelled. The revised Thesis shall be referred to the same examiner for his/her final recommendation on the Thesis which shall be only either for recommendation for the award or for rejection.
 - 18.3.2 If one examiner recommends the award of the degree while the other recommends rejection, then the Thesis shall be referred to the third examiner to be nominated by the Vice-Chancellor as in Clause 18.1. If two of the three examiners recommend the award, the Thesis shall be provisionally accepted. If two of the examiners recommend rejection, the Thesis shall be rejected and the registration of the scholar shall stand cancelled.
 - 18.3.3 If both the examiners recommend rejection, the Thesis shall be rejected and the registration of the scholar shall stand cancelled.
- 18.4 In case, the examiner does not insist to send the Thesis back to him/her, the Thesis shall be referred to the Doctoral Committee to ascertain the corrections carried out in the Thesis as suggested by the examiners.
- 18.5 Individual cases not covered by the above Clauses shall be referred to the Vice-Chancellor. If deemed fit, the Vice-Chancellor shall refer to the Research Board which in turn shall refer to the Syndicate, for necessary action.

19 ORAL EXAMINATION

19.1 On receipt of the evaluation reports, the Doctoral Committee shall meet **within three months** and recommend a panel of three experts (Other than the Parent Institution) from different recognized institutions within India, along with their publication details in the last five years for constitution of an Oral Examination Board. No two experts shall be from the same Institution. The Vice-Chancellor nominates one member from the panel of experts recommended by the Doctoral Committee. The Vice-Chancellor, if deems it necessary shall nominate a member from outside the panel.

19.2 The Oral Examination Board shall be constituted by the Vice-Chancellor as follows:

a. Indian Examiner of the Thesis or an expert from the panel (in the absence of the former)	Member
b. An expert from a recognized institution from the panel	Member
c. Joint Supervisor of the scholar, if applicable	Member
d. Supervisor of the scholar	Convener

19.3 The Oral examination shall be conducted **within three months** from date of issue of oral examination board as “Open Defence Type” Examination. The Oral examination should not be conducted on **Saturday, Sunday and public holidays**. The circular for the same shall be communicated to the Director (Research) /faculty members/ research scholars/other departments/ other Institutions, atleast three weeks prior to the Viva – Voce Examination. A minimum of ten members excluding Oral Examination Board members shall be present for the Viva-Voce Examination.

19.4 Viva-Voce Examination shall be held at the place of work of the Supervisor or at the place of Joint Supervisor (if the supervisor is from non recognized centre of Anna University) or at any recognized centre of Anna University (if both the supervisor and joint supervisor are from non recognized centre of Anna University) with prior approval from the Centre for Research.

19.5 If the Oral Examination Board reports the performance of the scholar as “not satisfactory” then he/she may opt to reappear for the Oral Examination at a later date (not later than three months from the date of the first Oral Examination). On the second occasion, the Oral Examination Board shall include one more expert member nominated by the Vice-Chancellor.

19.6 If the performance of the scholar in the Oral Examination in the second occasion also reported to be “not satisfactory”, the Vice-Chancellor, if deems it necessary, shall refer the remarks of the Oral Examination Board, along with the Thesis and comments of the Examiners, to a Committee constituted by the Vice-Chancellor for this purpose and the decision of the Vice-Chancellor shall be final.

- 19.7 On satisfactory completion of the Viva-Voce Examination, the scholar shall upload the soft copy of the corrected Thesis in accordance with the prescribed format and specification, duly certified by the Supervisor and Joint Supervisor (if applicable), that all the corrections have been incorporated in the Thesis as suggested by the examiners.

20 AWARD OF Ph.D. DEGREE

If the report of the Oral Examination Board is SATISFACTORY, the scholar shall be awarded Ph.D. Degree based on the specialization in which he/she got admission for Ph.D. programme (as per clause 6.1), under the Faculty of Civil Engineering/ Mechanical Engineering/ Electrical Engineering/ Information and Communication Engineering/ Technology/ Architecture and Planning/ Science and Humanities/ Management Sciences, with the approval of the Syndicate.

21 CANCELLATION OF REGISTRATION

- 21.1 The registration of a scholar who has not submitted his/her thesis before the end of the maximum duration including the extension period for the programme as in Clause 11.1 shall stand cancelled automatically.
- 21.2 The registration is liable for cancellation administratively by the Director (Research), if
- i. The scholar has not paid the semester fees within the stipulated time.
 - ii. Two semesters progress reports are not submitted or not satisfactory.
 - iii. If the scholar fails to complete the confirmation of provisional registration beyond three years from the date of registration for the Ph.D. programme.
 - iv. The performance is not satisfactory to the Doctoral Committee and accordingly recommended for cancellation.
 - v. Prior permission is not obtained for break of study from the Director (Research).
 - vi. The scholar wishes to withdraw the programme and requests to cancel his/her registration.
 - vii. Extension of time (beyond six years) not obtained as in Clause 11.2.
 - viii. Submission of Thesis beyond three months from the date of approval of Synopsis by the Doctoral Committee.
 - ix. Submission of revised thesis incorporating the suggestions of any examiner beyond six months.
 - x. The act of plagiarism involved in the journal publication/Synopsis/Thesis.
 - xi. Communicating with the thesis examiners in any form by the Scholar / Supervisor / Joint Supervisor (if any) / HoDs of the supervisor / Joint Supervisor or the Scholar.
 - xii. Non disclosure of relieving from the present job and taking up new job elsewhere by Scholar/Supervisor.

xiii. Any violation of the rules and regulations of Ph.D. Programme.

21.3 In all the above cancellation cases, the fees paid by the scholar shall not be refunded.

22 PUBLICATION OF THESIS

Papers arising out of the Thesis may be published by the scholar and the Supervisor. However the Thesis as a whole shall be published by the scholar and Supervisor after the award of the degree only with the approval of the University.

23 THE ACT OF PLAGIARISM

23.1 In the case of scholars who have committed the act of plagiarism in the Synopsis/ Thesis/journal publication, he/she shall be called for enquiry at the Centre for Research and shall be advised to rectify the plagiarism and resubmit the documents with appropriate penalty. If the scholar fails to rectify the plagiarism in the documents, the Thesis/degree shall be forfeited and his/her research registration shall be cancelled and also he/she shall be debarred to register for any other programme in the University.

23.2 For the abetment of above such action, the recognition of his/her Supervisor shall be withdrawn for a period of five years and he/she shall be debarred from guiding the scholars for any research programme in the University till such period.

23.3 If any scholar has committed an act of self plagiarism in the publications and ascertained by the Committee constituted by the Vice-Chancellor, such work shall not be allowed in his/her thesis and the scholar shall be fined upto Rs.50000/- with a warning to the Supervisor. The Synopsis / Thesis of such scholar shall be accepted only based on a new publication in a referred journal (as applicable). If plagiarism is detected in the Publications / Thesis of any other scholar under the same supervisor, the recognition of his/her Supervisorship shall be withdrawn for a period of five years and he/she shall be debarred from guiding the scholars for any research programme in the University till such period.

23.4 If the plagiarism is observed in the later stage at any point of time, the Ph.D. Degree awarded to the scholar shall be withdrawn.

24 POWER TO MODIFY

Not with standing all that has been stated above, the Syndicate has the right to modify any of the above regulation from time to time only with a valid reason for the betterment of the reputation of the University.

Note: The scholar shall be governed by the regulations as in force from time to time. The Supervisors and scholars are requested to visit the University website “<https://cfr.annauniv.edu>” for updates and announcements periodically.

RESEARCH CONDUCT RULES

1.1 Research Ethics:

- 1.1.1 All individuals conducting research in connection with the University should incorporate appropriate consideration of ethical issues into the design and management of projects.
- 1.1.2 Research involving interaction with environmental issues, human subjects or communities should be informed by context specific ethical practice. Scholars must respect the human rights and dignities of all those involved in any inquiry project and must appropriately address questions of consent, power relations, deception, confidentiality and privacy. In particular, scholars must address a range of complex issues around developing and maintaining respectful and ethical relationships with research partners based on mutual respect for academic traditions and institutional circumstances. Information and/or complaints regarding the above issues, shall be referred to the committee constituted by the Vice-Chancellor for necessary action.
- 1.2 At the time of admission, each scholar must give an undertaking that he/she abide by the regulations.

1.3 Misconduct in Research:

- 1.3.1 Falsification, fabrication, or dishonesty in creating or reporting laboratory results, research results, and/or any other assignments; Sexual harassment of other scholars; Contacting the examiner about thesis evaluation are the mode for misconduct.
- 1.3.2 Submitting plagiarized work for an academic requirement. Plagiarism means representation of another's work or ideas as one's own; it includes the unacknowledged word-for-word use and/or paraphrasing of another person's work, and/or the inappropriate unacknowledged use of another person's ideas.
- 1.3.3 Submitting substantially the same work to satisfy requirements for one course or academic requirement that has been submitted in satisfaction of requirements for another course or academic requirement without permission of the instructor of the course for which the work is being submitted or supervising authority for the academic requirement.
- 1.3.4 All complaints related to research activities or any matters relating to differences among scholars or complaints about the supervisor or seeking of any information related to research shall be addressed to the Director, Centre for Research. Only in the absence of any response, alternate measures shall be sought.
- 1.4 Any scholar exhibiting misconduct, their registration will be cancelled. Such a scholar will not be eligible for readmission to any of the courses of this University. Further, if such scholar receives any fellowship from the University, it will be withdrawn and the

fellowship has to be refunded from the date of the last award. Vice-Chancellor shall be the ultimate authority in imposing disciplinary actions against the scholars for acts of prohibited behaviour.

1.5 Right to Appeal

1.5.1 The scholar/scholars aggrieved by the action of any authority of the University can appeal to the Director, Centre for Research and any scholar aggrieved by the action of the Director, Centre for Research can appeal to the Registrar and then to Vice-Chancellor. The decision of the Vice-Chancellor shall be final and binding on the scholars.

1.5.2 The scholar shall seek legal remedy about any matter with prior notice and only after their representations to the higher authorities have been negative.

1.6 If Supervisors are found to indulge in any of following acts, based on the severity of the complaint, the supervisorship will be cancelled for a specific duration and disciplinary action will be taken.

- i. Exploiting the services of the scholar for completing the academic tasks assigned to an individual.
- ii. Any act of financial extortion or forceful expenditure burden put on the scholar.
- iii. Any act of sexual abuse or abuse by spoken words, phone calls, short message service (sms) through mobile, emails, posts, public insult leading to the discomfort to the scholar.

1.7 For Supervisors under suspension/ undergoing any disciplinary proceedings of the University, and their scholar(s) had submitted their synopsis or thesis under their guideship, a Research Coordinator is allocated to the Scholar(s) to discharge the following responsibility to

(a) arrange the Doctoral Committee meetings.

(b) facilitate the scholar in preparing the synopsis and thesis

(c) conduct the Viva-Voce examination

The Research Coordinator is not entitled to take the credit of the Ph.D degree of such scholar(s).

In all other cases Supervisor-in-charge should be nominated by the Director, Centre for Research based on the request of the Supervisor and / or the recommendation of the Head of the Department of the Supervisor. The Supervisor-in-charge shall function upto one year or till Supervisor resumes duty. However if the supervisor continues under suspension/ undergoing any disciplinary proceedings of the University for more than one year alternate supervisor shall be nominated by the Director, Centre for Research based on the request of the Supervisor-in-Charge and the recommendation of the Head of the Department.

GUIDELINES FOR THE PREPARATION OF SYNOPSIS

Synopsis should outline the research problem, the methodology used for tackling it and the summary of the findings. **The size of Synopsis should not exceed 15 pages of typed matter reckoned from the first page to the last page including the List of Publications.**

The sequence in which the Synopsis should be arranged is as follows with References and List of Publications in separate pages:

1. Cover Page and Title page (as shown in the Annexure I)
2. Text divided into suitable Headings (numbered consecutively)
3. References (not more than 15) (Alphabetical order)
4. List of Publications (those published/accepted for publication in Journals. Mention Impact Factor of the Journal).

Standard A4 size (297mm x 210mm) bond paper may be used for preparing the copies. The Synopsis should have the following page margins:

Top edge	:	30 to 35 mm
Bottom edge	:	25 to 30 mm
Left side	:	35 to 40 mm
Right side	:	20 to 25 mm

The Synopsis should be prepared on good quality white paper preferably not lower than 80GSM. One and a half line spacing should be used for typing the general text. The general text shall be typed in Font Style Times New Roman and Font Size 13. One or two Tables/ Figures may be included at appropriate places in the text and they should conform to the margin specifications. All page numbers (Arabic numbers) should be typed without punctuation on the upper right hand corner 20 mm from top with the last digit in line with the right hand margin. Synopsis should be bound with black calico cloth and using flexible cover of thick white art paper. The cover should be printed in black letters and the text for printing should be identical to what has been prescribed for the title page.

REFERENCES

1 Journal Article : with Single Author

Waldron, S 2008, 'Generalized Welch bound equality sequences are tight frames', IEEE Transactions on Information Theory, vol. 49, no. 9, pp. 2307-2309.

2 Journal Article : with Two Authors

Conley, TG & Galeson, DW 1998, 'Nativity and wealth in mid-nineteenth century cities', Journal of Economic History, vol. 58, no. 2, pp. 468-493.

3 Journal Article : with more than two Authors

Alishahi, K, Marvasti, F, Aref, VA & Pad, P 2009, 'Bounds on the sum capacity of synchronous binary CDMA channels', Journal of Chemical Education, vol. 55, no. 8, pp. 3577-3593.

4 Books

Holt, DH 1997, Management Principles and Practices, Prentice-Hall, Sydney.

5 E-book

Aghion, P & Durlauf, S (eds.) 2005, Handbook of Economic Growth, Elsevier, Amsterdam. Available from: Elsevier books. [4 November 2004].

6 Conference Proceeding Paper with editors

Riley, D 1992, 'Industrial relations in Australian education', in Contemporary Australasian industrial relations: proceedings of the sixth AIRAANZ conference, ed. D. Blackmur, AIRAANZ, Sydney, pp. 124-140.

7 Conference Proceeding Paper without editors

Fan, W, Gordon, MD & Pathak, R 2000, 'Personalization of search engine services for effective retrieval and knowledge management', Proceedings of the twenty-first international conference on information systems, pp. 20-34.

8 Website

Australian Securities Exchange 2009, Market Information. Available from: <http://www.asx.com.au/professionals/market_information/index.htm>. [5 July 2009].

9 Patent

Cookson, AH 1985, Particle trap for compressed gas insulated transmission systems, US Patent 4554399.

10 Thesis: Unpublished

Hos, JP 2005, Mechanochemically synthesized nanomaterials for intermediate temperature solid oxide fuel cell membranes. Ph.D. thesis, University of Western Australia.

11 Newspaper: Print

Ionesco, J 2001, 'Federal election: new Chip in politics', The Advertiser 23 October, p. 10.

ANNEXURE I

A typical Specimen of Cover Page and Title Page

**VIBRATION AND THERMAL ANALYSIS OF
6/4 POLE SWITCHED RELUCTANCE MOTOR**

 <1.5 line spacing>

A SYNOPSIS

Submitted by

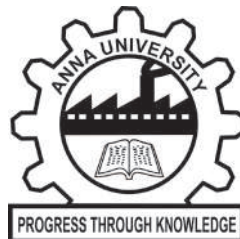
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SAROJA MUTHUSAMY N T

in partial fulfillment of the requirements for the degree of

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DOCTOR OF PHILOSOPHY



FACULTY OF ELECTRICAL ENGINEERING

ANNA UNIVERSITY

CHENNAI 600 025

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JANUARY 2020

VIBRATION AND THERMAL ANALYSIS OF 6/4 POLE SWITCHED RELUCTANCE MOTOR

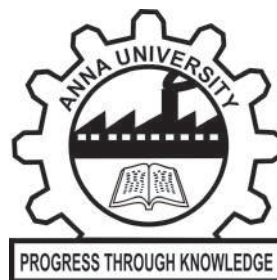
A SYNOPSIS

Submitted by

SAROJA MUTHUSAMY N T

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DOCTOR OF PHILOSOPHY



FACULTY OF ELECTRICAL ENGINEERING

ANNA UNIVERSITY

CHENNAI 600 025

JANUARY 2020

GUIDELINES FOR THE PREPARATION OF THESIS

The scholars are expected to read carefully the Guidelines given in the sequel and meticulously follow them in the preparation of the Thesis. Non-compliance with any of these instructions may lead to the rejection of the Thesis submitted.

1 GENERAL

The manual is intended to provide broad guidelines to the research scholars in the preparation of the Thesis. In general, the Thesis shall report, in an organized and scholarly fashion, an account of original research work of the research scholar leading to the discovery of new facts or techniques or correlation of facts already known (analytical, experimental, hardware oriented, etc.). Thesis shall demonstrate a quality as to make a definite contribution to the advancement of knowledge and the research scholar's ability to undertake sustained research and present the findings in an appropriate manner with actual accomplishments of the work.

2 SIZE OF THESIS

The size of the Thesis shall be normally between 100 and 400 pages of typed matter reckoned from the first page of Chapter 1 to the last page of the thesis excluding reference section.

3 ARRANGEMENT OF THE CONTENTS OF THE THESIS

The sequence in which the Thesis material should be arranged and bound is as follows:

1. Cover Page and Title page (as shown in Annexure II)
2. Certificate (as shown in Annexure III)
3. Abstract
4. Acknowledgement (one page only)
5. Table of Contents (as shown in Annexure IV)
6. List of Tables
7. List of Figures
8. List of Symbols and Abbreviations (as shown in Annexure V)
9. Chapters
10. Appendices

11. References (Alphabetical order)

12. List of Publications

The Tables and Figures should be included subsequently after referring them in the text of the Thesis. **The thesis from Chapters should be printed on both sides.**

4 PAGE DIMENSIONS AND MARGIN

Standard A4 Size (297 mm x 210 mm) bond paper may be used for preparing the copies. The dimensions of the final bound Thesis (3 copies) report should be 290 mm x 205 mm.

The final Thesis (at the time of submission) should have the following page margins:

Top edge : 30 to 35 mm

Bottom edge: 25 to 30 mm

Left side : 35 to 40 mm

Right side : 20 to 25 mm

The Thesis should be prepared on good quality white paper preferably not lower than 80GSM. Tables and Figures should conform to the margin specifications. Large size Figures should be photographically or otherwise reduced to the appropriate size before insertion.

5 MANUSCRIPT PREPARATION

In the preparation of the manuscript, care should be taken to ensure that all textual matter is typewritten to the extent possible in the same format as may be required for the final Thesis. Hence some of the information required for the final typing of the Thesis is also included in this section.

The headings of all items from 2 to 12 listed in section 3 should be typed in capital letters without punctuation and centered 50 mm below the top of the page. The text should commence 4 spaces below this heading. The page numbering for all items from 1 to 8 should be done using lower case Roman numerals and the pages thereafter should be numbered using Arabic numerals.

5.1 Cover Page & Title Page - A specimen copy of the Cover page and Title page for the Thesis is given in Annexure II.

5.2 Bonafide Certificate - The Certificate shall be typed in double line spacing using Font Style Times New Roman and Font Size 13 as per the format shown in Annexure III. The

certificate shall carry the Supervisor's signature and shall be followed by the **Supervisor's name, academic designation (not any other responsibilities of administrative nature)**, department and full address of the institution where the Supervisor has guided the research scholar. The term 'SUPERVISOR' must be typed in capital letters between the Supervisor's name and academic designation. Signature of the Joint Supervisor with the details specified as above should be included wherever it is applicable.

- 5.3 Abstract** - Abstract should be an essay type of narration not exceeding four pages outlining the research problem, methodology used for tackling it and a summary of the findings. This shall be typed in one and a half line spacing using Font Style Times New Roman and Font Size 13.
- 5.4 Acknowledgement** – It should be brief and should not exceed one page when typed in one and a half line spacing. The scholar's signature shall be made at the bottom right end above his/her name typed in capitals.
- 5.5 Table of Contents** - The Table of contents should list all captions following it as well as any caption which precedes it. The title page, Certificate and Acknowledgment will not find a place among the items listed in the Table of Contents but the page numbers of which are in lower case Roman letters. One and a half line spacing should be adopted for typing the matter under this head. A specimen copy of the Table Contents for the Thesis is given in Annexure IV.
- 5.6 List of Table** - The list should use exactly the same captions as they appear above the Tables in the text. One and a half line spacing should be adopted for typing the matter under this head.
- 5.7 List of Figures** - The list should use exactly the same captions as they appear below the Figures in the text. One and a half line spacing should be adopted for typing the matter under this head.
- 5.8 List of Symbols and Abbreviations** - One and a half line spacing should be adopted for typing the matter under this head. Standard symbols, abbreviations, etc. should be used. **The list should be arranged alphabetically with respect to the contents on the right side as shown in Annexure V.**
- 5.9 Chapters** - The chapters may be broadly divided into 3 parts (i) Introductory chapter, (ii) Chapters developing the main theme of the Thesis and (iii) Results, Discussion and Conclusion. The main text shall be divided into several chapters and each chapter may be further divided into several divisions and sub-divisions.

- Each chapter should be given an appropriate title.
- Tables and Figures in a chapter should be placed in the immediate vicinity of the reference where they are cited.
- Footnotes should be used sparingly. They should be typed single space and placed directly underneath in the very same page which refers to the material they annotate.

5.10 Appendices - Appendices are provided to give supplementary information, which if included in the main text may serve as a distraction and cloud the central theme under discussion.

- Appendices should be numbered using Arabic numerals, e.g. Appendix 1, Appendix 2, etc.
- Appendices, Tables and references appearing in appendices should be numbered and referred to at appropriate places just as in the case of chapters.
- Appendices shall carry the title of the work reported and the same title shall be included in the Table of Contents page.

5.11 List of References - Any works of other researchers, if used either directly or indirectly, the origin of the material thus referred to at appropriate places in the Thesis should be indicated. The author's publications during the period of research should not be included in the references and can be separately mentioned as in 5.10. A paper, a monograph or a book may be designated by the name of the first author followed by the year of publication, placed inside brackets at the appropriate places in the Thesis. The citation may assume any one of the following forms.

How to cite

- The structure of a citation is the author's surname and year of publication.
- Single author is cited as "Jones (2001)".
- Two authors are cited using "&" (Deane & Jones 1991) or Smith *et al.* (1992)
- More than two authors are cited using "*et al.*" (Smith *et al.* 1992) or Smith *et al.* (1992).

- In case the information being discussed has been written in several different sources then cite them all in one set of brackets in chronological order of publication (Midgley 1994; Smith 1994; Philip 2002).
- If an author published several papers in 2005, the year of the first publication (in the alphabetic order of the references) is cited and referenced as 2005a, the second as 2005b and so on.
- A citation is placed wherever appropriate in or after the sentence. If it is at the end of a sentence, it is placed before the full stop.
- Complete citations and Source shall be provided in alphabetical order in reference section.
- All citations shall be in the same font as the main text.
- All figures and charts etc., taken from other sources shall be cited beneath within brackets, author name, source followed by, year in Times New Roman, Normal, font-size: 11 points, as “(Source: Jones, *et al.* 2001)”. If it is sourced from Web pages the citation style shall be as “(Source: www.abc.com)” and the complete URL shall be given in the reference section.

Examples of Citation

- (i) An improved algorithm has been adopted in the literature (Waldron 2008).
- (ii) Conley & Galeson (1998) have dealt at length this principle.
- (iii) The problem of mechanical manipulators has been studied by Alishahi et al (2009)

The listing should be typed 4 spaces below the heading “REFERENCES” in single spacing. The reference material should be listed in the alphabetical order of the first author. The name of the author/authors should be immediately followed by the other details and year. A typical illustrative list given below relates to the citation example quoted above.

REFERENCES

1 Journal Article : with Single Author

Waldron, S 2008, 'Generalized Welch bound equality sequences are tight frames', IEEE Transactions on Information Theory, vol. 49, no. 9, pp. 2307-2309.

2 Journal Article : with Two Authors

Conley, TG & Galeson, DW 1998, 'Nativity and wealth in mid-nineteenth century cities', Journal of Economic History, vol. 58, no. 2, pp. 468-493.

3 Journal Article : with more than two Authors

Alishahi, K, Marvasti, F, Aref, VA & Pad, P 2009, 'Bounds on the sum capacity of synchronous binary CDMA channels', Journal of Chemical Education, vol. 55, no. 8, pp. 3577-3593.

4 Books

Holt, DH 1997, Management Principles and Practices, Prentice-Hall, Sydney.

5 E-book

Aghion, P & Durlauf, S (eds.) 2005, Handbook of Economic Growth, Elsevier, Amsterdam. Available from: Elsevier books. [4 November 2004].

6 Conference Proceeding Paper with editors

Riley, D 1992, 'Industrial relations in Australian education', in Contemporary Australasian industrial relations: proceedings of the sixth AIRAANZ conference, ed. D. Blackmur, AIRAANZ, Sydney, pp. 124-140.

7 Conference Proceeding Paper without editors

Fan, W, Gordon, MD & Pathak, R 2000, 'Personalization of search engine services for effective retrieval and knowledge management', Proceedings of the twenty-first international conference on information systems, pp. 20-34.

8 Website

Australian Securities Exchange 2009, Market Information. Available from: <http://www.asx.com.au/professionals/market_information/index.htm>. [5 July 2009].

9 Patent

Cookson, AH 1985, Particle trap for compressed gas insulated transmission systems, US Patent 4554399.

10 Thesis: Unpublished

Hos, JP 2005, Mechanochemically synthesized nanomaterials for intermediate temperature solid oxide fuel cell membranes. Ph.D. thesis, University of Western Australia.

11 Newspaper: Print

Ionesco, J 2001, 'Federal election: new Chip in politics', The Advertiser 23 October, p. 10.

5.12 List of Publications - The list of publications (those already published/accepted for publication in Journals and papers presented in Conferences/Symposia) made by research scholar during the period of research shall be reported in the Table of Contents. Mention Impact Factor of the Journal (if applicable).

5.13 Tables and Figures – “Table” means tabulated numerical data in the body of the Thesis as well as in the appendices. All other non-verbal material used in the body of the Thesis and appendices such as charts, graphs, maps, photographs and diagrams may be designated as Figures.

- A Table or Figure including caption should be accommodated within the prescribed margin limits and appear on the page following the page where their first reference is made.
- Tables and Figures on half page or less in length may appear on the same page along with the text. However, they should be separated from the text both above and below by triple spacing.
- All Tables and Figures should be prepared on the same paper or material used for the preparation of the rest of the Thesis.
- Two or more small Tables or Figures may be grouped if necessary in a single page.
- Wherever possible, the photograph(s) shall be reproduced on a full sheet of photographic paper or standard A4 size paper.
- More than one photograph can be included in a page.
- Samples of Fabric, Leather, etc., if absolutely necessary may be attached evenly in a page and fixed/pasted suitably and should be treated as Figures.

6. TYPING INSTRUCTIONS

6.1 General

This section includes additional information for final typing of the Thesis. The impressions on the typed/printed copies should be black in colour.

A sub-heading at the bottom of a page must have atleast two full lines below it or else it should be carried over to the next page.

The last word of any page should not be split using a hyphen. One and a half line spacing should be used for typing the general text. The general text shall be typed in

Font Style Times New Roman and Font Size 13. Single spacing should be used for typing:

- (i) Long Tables
- (ii) Long quotations
- (iii) Foot notes
- (iv) Multiline captions
- (v) References

All quotations exceeding one line should be typed in an indented space - the indentation being 15 mm from either side of the margin.

6.2 Chapters

The format for typing Chapter headings, Division headings and Sub-division headings are explained by the following illustrative examples.

Chapter heading	:	CHAPTER 1
		INTRODUCTION
Division heading	:	1.1 OUTLINE OF THESIS
Sub-division heading	:	1.1.1 Literature Review
		1.1.1.1 Synthetic aperture radars on satellites

The word CHAPTER without punctuation should be centered 50 mm down from the top of the page. Two spaces below, the title of the chapter should be typed centrally in capital letters. The text should commence 4 spaces below this title, the first letter of the text starting 20 mm inside from the left hand margin.

The division and sub-division captions along with their numberings should be left justified. The typed material directly below division or sub-division heading should commence 2 spaces below it and should be offset 20 mm from the left hand margin. Within a division or sub-division paragraphs are permitted. Even paragraph should commence 3 spaces below the last line of the preceding paragraph, the first letter in the paragraph being offset from the left hand margin by 20 mm.

7. NUMBERING INSTRUCTIONS

7.1 Page Numbering

All page numbers (whether it be in Roman or Arabic numbers) should be typed without punctuation on the upper right hand corner 20 mm from the top with the last

digit in line with the right hand margin. The preliminary pages of the Thesis (such as Title page, Acknowledgement, Table of Contents, etc.) should be numbered in lower case Roman numerals. The title page will be numbered as (i) but this should not be typed. The page immediately following the title page shall be numbered as (ii) and it should appear at the top right hand corner as already specified. Pages of main text, starting with Chapter 1 should be consecutively numbered using Arabic numerals.

7.2 Numbering of Chapters, Divisions and Sub-Divisions

The numbering of chapters, divisions and sub-divisions should be done using Arabic numerals only and further decimal notation should be used for numbering the divisions and sub-divisions within a chapter. For example sub-division 4 under division 3 belonging to chapter 2 should be numbered as 2.3.4. The caption for the sub-division should immediately follow the number assigned to it.

Every chapter beginning with the first chapter should be serially numbered using Arabic numerals. Appendices, included if any, should also be numbered in an identical manner starting with Appendix 1.

7.3 Numbering of Tables and Figures

Tables and Figures appearing anywhere in the Thesis should bear appropriate numbers. The rule for assigning such numbers is illustrated by an example. Thus, if a Figure in Chapter 3, happens to be the fourth then assign 3.4 to that Figure.

Identical rules apply for Tables except that the word Figure is replaced by the word Table. If Figures (or Tables) appear in appendices then Figure 3 in Appendix 2 will be designated as Figure A 2.3. If a table to be continued into the next page this may be done, with unfinished Table, continued into the next page, with title Table 2.1 (continued) placed centrally.

7.4 Numbering of Equations

Equations appearing in each Chapter or Appendix should be numbered serially, the numbering should commence afresh for each Chapter or Appendix. Thus for example, an equation appearing in Chapter 4, if it happens to be the eighth equation in that Chapter should be numbered as (4.8) thus:

$$\left[\frac{\partial}{\partial x} \left[\frac{p^2}{h} \right] + \frac{\partial}{\partial y} \left[\frac{pq}{h} \right] = -gh \frac{\partial \eta}{\partial x} - k \frac{\sqrt{p^2 + q^2}}{h^2} p + \frac{1}{\rho_w} \left[\frac{\partial}{\partial x} (h \tau_{xx}) + \frac{\partial}{\partial y} (h \tau_{xy}) \right] \right] \quad (4.8)$$

While referring to this equation in the body of the Thesis it should be referred to as Equation (4.8).

8. BINDING SPECIFICATIONS

- Thesis (3 copies) side pinning/stitching, covered with wrapper printed on 300 gsm white art card and outer side gloss laminated, adhesive binding. The cover should be printed in black letters and the text for printing should be identical to what has been prescribed for the title page.

9. ONLINE SUBMISSION OF THESIS

- After viva-voce examination the final version of the thesis need to be prepared by incorporating all corrections suggested by the examiners and the same shall be uploaded through the scholar login available in the web page of Centre for Research.
- The final version of the thesis copy should contain a certificate given in Annexure VI and a scanned copy of the minutes of the oral examination board. These two items should be placed in between the title page and certificate.

ANNEXURE II

A typical Specimen of Cover Page and Title Page

**VIBRATION AND THERMAL ANALYSIS OF 6/4 POLE
SWITCHED RELUCTANCE MOTOR**

 <1.5 line spacing>

A THESIS

Submitted by

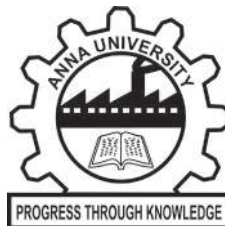
 <Italic>

SAROJA MUTHUSAMY N T

in partial fulfillment of the requirements for the degree of

 <Italic> <1.5 line spacing>

DOCTOR OF PHILOSOPHY



FACULTY OF ELECTRICAL ENGINEERING

ANNA UNIVERSITY

CHENNAI 600 025

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JANUARY 2020

VIBRATION AND THERMAL ANALYSIS OF 6/4 POLE SWITCHED RELUCTANCE MOTOR

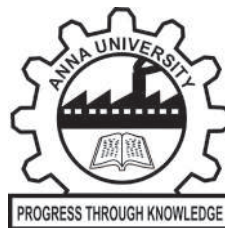
A THESIS

Submitted by

SAROJA MUTHUSAMY N T

in partial fulfillment of the requirements for the degree of

DOCTOR OF PHILOSOPHY



FACULTY OF ELECTRICAL ENGINEERING

ANNA UNIVERSITY

CHENNAI 600 025

JANUARY 2020

ANNEXURE III

A typical Specimen of Certificate

ANNA UNIVERSITY

CHENNAI 600 025

<1.5 line spacing>

BONAFIDE CERTIFICATE

The research work embodied in the present Thesis entitled “**VIBRATION AND THERMAL ANALYSIS OF 6/4 POLE SWITCHED RELUCTANCE MOTOR**” has been carried out in the <<Name of the Supervisor's Department>>, <<Name of the College>>,<<Place>>. The work reported herein is original and does not form part of any other thesis or dissertation on the basis of which a degree or award was conferred on an earlier occasion or to any other scholar.

I understand the University's policy on plagiarism and declare that the thesis and publications are my own work, except where specifically acknowledged and has not been copied from other sources or been previously submitted for award or assessment.

<<Signature of the Scholar>>

<<Name>>

Counter signed by

<<Signature of the Joint Supervisor>>

<<Name>>

JOINT SUPERVISOR (If applicable)

<<Designation & Address >>

<<Signature of the Supervisor>>

<<Name>>

SUPERVISOR

<<Designation & Address >>

ANNEXURE IV

A typical Specimen of Table of Contents

TABLE OF CONTENTS

CHAPTER NO.	TITLE	PAGE NO.
	ABSTRACT	iii
	LIST OF TABLES	xvi
	LIST OF FIGURES	xviii
	LIST OF SYMBOLS AND ABBREVIATIONS	xxvii
1	INTRODUCTION	1
	1.1 GENERAL	1
	1.2 OBJECTIVES OF THE RESEARCH	3
	1.3 LITERATURE REVIEW	4
	1.3.1 Aircraft Landing Operations	6
	1.3.2 Flight Control System	19
	1.3.3 Intelligent Control Design Techniques	29
2	DEVELOPMENT OF NON-LINEAR SIX DEGREES-OF-FREEDOM AIRCRAFT MODEL	45
	2.1 GENERAL	45
	2.2 BUILDING AN AIRCRAFT	54
	2.2.1 Configuration Script	54
	2.2.1.1 Aerodynamic section	58
	2.2.1.2 Propeller section design	60
	2.2.1.3 Engine section comparison	63
	2.2.1.4 Inertia section	66

ANNEXURE V
LIST OF SYMBOLS AND ABBREVIATIONS

ω	-	Absolute frequency
HOA	-	Acetic acid
Al	-	Aluminum
ASTM	-	American standard testing mesh
CaCO_3	-	Calcium carbonate
CIA	-	Chemical index of alteration
ρ	-	Density of the fluid
θ	-	Direction of wave propagation
EF	-	Enrichment factor
ω_p	-	Frequency of the peak
Ω	-	Frequency of the waves
FP	-	First percentile
Γ	-	Gamma
g	-	Gram
HCl	-	Hydrochloric acid
Fe_2O_3	-	Iron oxide
MgO	-	Magnesium oxide
θ_m	-	Mean wave direction
mg	-	Milligram
HNO_3	-	Nitric acid
OC	-	Organic carbon
ppm	-	Parts per million
$\text{K}_2\text{Cr}_2\text{O}_7$	-	Potassium dichromate
φ	-	Potential function
SEM	-	Scanning electron microscope
Ag_2SO_4	-	Silver sulphate
τ	-	Time lag between samples
ζ	-	Vertical displacement

ANNEXURE VI

CERTIFICATE

1. This is to certify that no corrections/suggestions were pointed out by the Indian / Foreign Examiner(s) in the Thesis titled “.....” submitted by Mr./Ms.....

(OR)

2. This is to certify that all corrections and suggestions pointed out by the Indian / Foreign Examiner(s) are incorporated in the Thesis titled “.....” submitted by Mr./Ms.....

JOINT SUPERVISOR
(If applicable)

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