

Minutes of the 28<sup>th</sup> SCSA meeting held on 03.05.2010 at 11.00 am  
in the Office of the Director of the Institute

The following were present:

1. Dr. M N Bandyopadhyay, Director In Chair
2. Dr. Krishna Gopal, Dean (P&D)
3. Prof. R K Bansal, Dean (Academic)
4. Dr. T K Garg, Dean (Faculty Welfare)
5. Dr S K Sharma, Dean (Estate, Construction & Elect. Mainte.)
6. Dr. Kuldeep Kumar, Professor & Head, Mathematics Department
7. Dr. N.K Gupta, Professor & Head, Civil Engineering Department
8. Dr. S S Rattan, Professor & Head, Mech. Engg. Deptt.
9. Dr. K S Sandhu, Professor & Head, Electrical Engg. Deptt.
10. Dr. Rajender Kumar, Controller of Examinations
11. Dr. S K Mahna, Professor & Head, Physics Deptt.
12. Dr. R K Sharma, Associate Professor & Head, Elect. & Comm. Engg. Deptt.
13. Dr. S.M Gupta, Secretary, Alumni Association as Special Invitee for Item No.2
14. Dr. Dinesh Kumar, Associate Professor & Head, Chemistry Deptt.
15. Prof. (Mrs.) Manjula Sharma, Associate Professor & Head, HuSS Deptt.
16. Dr. Ashwani Jain, Prof. Incharge (Academic & Senate Affairs)
17. Dr. Mayank Dave, Associate Professor & Head, Computer Applications &  
Computer Engg. Deptt
18. Sh. R P S Lohchab, Registrar Secretary, SCSA

The following decisions were taken:

1. **To consider the recommendations submitted by the Committee constituted for reviewing the existing Ph.D. Ordinance of the Institute as per UGC Regulation, 2009**

The SCSA considered the recommendations submitted by the Committee constituted for reviewing the existing Ph.D. Ordinance of the Institute as per UGC Regulation, 2009. The recommendations were discussed in detail and some modifications were suggested. It was decided that introduction of admission test and course work may be deferred for the time being. Other revisions suggested by the committee were accepted with minor modifications. The modified and approved Ph.D. Ordinance of the Institute, applicable from Session 2010-2011, is enclosed as Appendix-I.



2. **To consider the matter of funding of Dr. R.P. Singh Medal**

The SCSA considered the matter of funding of Dr. R.P. Singh Medal. It was decided that the matter of shortfall of funds for the award of medal be referred to the Finance Committee for consideration. The SCSA was of the view that the Institute should frame a general policy for accepting the offers to institute medals to be awarded in specific names or for specific cause etc.

3. **To consider the Academic Calendar for the Session 2010-2011**

The SCSA considered the Academic Calendar for the Session 2010-2011. Some modifications were suggested. The modified and approved Academic Calendar for the Session 2010-2011 is enclosed as Appendix-II.

4. **To consider the requests of Ms. Monika Gupta and Mr. Kushal Sharma, full-time Ph.D research scholars in the Departments of Physics and Mathematics for fee waiver**

The SCSA considered the requests of Ms. Monika Gupta and Mr. Kushal Sharma, full-time Ph.D research scholars in the Departments of Physics and Mathematics for fee waiver. The SCSA did not agree to their request.

5. **To consider the request of Mr. Pawan Kumar, Ph.D. research scholar in Mathematics for conversion of his registration from full-time to part-time**

The SCSA considered and allowed conversion of Ph.D. registration of Mr. Pawan Kumar, research scholar in the Deptt. of Mathematics from full-time to part-time.

6. **To consider the requests of Mr. Raghwendra Tiwari, Roll No. 803/03, M.Tech (EC&CE) student and Mr. Raj Kumar Saini, Roll No. 707/04, M.Tech (Civil Engg.) student for granting extension for submitting M.Tech dissertations in their respective specializations**

The SCSA considered the requests of Mr. Raghwendra Tiwari, Roll No. 803/03, M.Tech (EC&CE) student and Mr. Raj Kumar Saini, Roll No. 707/04, M.Tech (Civil Engg.) student for granting extension for submitting M.Tech dissertations in their respective specializations. It was decided that the matter be referred to the Senate for consideration.

7. **Any Other Item**

Under any other item

1. The SCSA considered the request of some B.Tech. final year students for allowing them to reappear in internal sessional improvement for both odd and even semesters simultaneously. The SCSA did not agree to their request. Further, it was decided that the matter be referred to the Senate.

2. The SCSA considered and approved the proposed revisions in the syllabi of the following subjects w.e.f. Session 2010-2011:

- i) B.Tech. 3<sup>rd</sup> Semester (Mech.): MET-203 Strength of Materials-I
- ii) B.Tech. 4<sup>th</sup> Semester (Mech.): MET-204 Strength of Materials-II
- iii) B.Tech. 3<sup>rd</sup> Semester (IEM): IEM-203 Strength of Materials

The revised and approved syllabi are enclosed as Appendix-III.


The meeting ended with a vote of thanks to the Chair.

6/5/2010

(R P S Lohchab)  
Registrar & Secretary, SCSA

6/5/2010

Approved



(M N Bandyopadhyay)  
Director

seen 6/5

seen  
6/5/2010



NATIONAL INSTITUTE OF TECHNOLOGY  
KURUKSHETRA

ORDINANCES & REGULATIONS FOR THE  
DEGREE OF DOCTOR OF PHILOSOPHY

**PREAMBLE**

The National Institute of Technology, Kurukshetra offers through its Departments, postgraduate programmes leading to the award of the Doctorate (Ph.D.) degree. The award of the Doctorate degree is in recognition of high academic achievements, quality research, and application of knowledge to the solution of technical and scientific problems in Science, Technology, and Humanities & Social Sciences.

The Institute undertakes sponsored research and development projects from industrial and other organizations in public, as well as in private sectors. The Institute also provides opportunities for research in inter-disciplinary areas through a system of co-supervision.

The research work is required to be an original work characterized either by the discovery of facts, or by a fresh approach towards the interpretation and application of facts, or development of equipment, making a significant and distinct advance in technology. It shall evince the scholar's capacity for critical examination and sound judgment and shall represent original contribution to the existing knowledge.

**ORDINANCES**

**1. DEFINITIONS**

- (i) "NITK" shall mean the National Institute of Technology, Kurukshetra.
- (ii) "Research Scholar" shall mean a person who is registered for the Ph.D. programme in a Department of the NITK.
- (iii) "Part-time Research Scholar" shall mean a research scholar who in addition to devoting his/her time towards discharging his/her employment responsibilities also devotes his/her time towards the pursuit of his/ her Ph.D. research programme.
- (iv) "Full-time Research Scholar" shall mean a research scholar devoting full time at NITK towards the pursuit of his Ph.D. research programme.
- (v) "Supervisor" shall mean a member of the academic staff of the NITK, appointed by the DRC to guide/supervise the Ph.D. research/ academic work of the scholar.
- (vi) "Co-Supervisor" shall mean additional supervisor(s) as appointed by the DRC. The Co-supervisor(s) may be from NITK itself, or from any other reputed laboratory, research Institute, reputed Institutes like IIT's, NIT's, and reputed Universities. The Co-supervisor(s) must have the academic and research qualifications as prescribed for a supervisor.
- (vii) "Caretaker Supervisor" shall mean a supervisor appointed to look after the scholar's research interests in the absence of the regular supervisor when the synopsis of the thesis has been submitted. The caretaker supervisor also must have the academic and research qualifications as prescribed for a supervisor.



- (viii) "Educational Institute" shall mean those institutes/colleges which run full-time Bachelor's. or higher degree programmes.
- (ix) "ORG" shall mean a PSU/ Govt. Deptt. / R&D Unit.
- (x) "Registration Period" shall mean the length of the time span for which a person remains a research scholar.
- (xi) "Minimum Registration Period" shall mean the minimum period for which a scholar must be registered to complete the requirements for the degree of Ph.D.
- (xii) "Degree" shall mean the Degree of Doctor of Philosophy (Ph.D.) of the NITK.
- (xiii) "Dean" shall mean the Dean (Academic) of the NITK.
- (xiv) "COE" shall mean the Controller of Examinations of the NITK.
- (xv) "HOD" shall mean Head of Department in which Research Scholar is registered/ proposes to register.
- (xvi) "DRC" shall mean the Department Research Committee of a Deptt. of NITK
- (xvii) "BOS" shall mean the Board of Studies of a Deptt. of the NITK.
- (xviii) "RAC" shall mean Research Advisory Committee of the research scholar.

NOTE: 'He' & 'His' imply 'he' / 'she' and 'his' / 'her' respectively in the whole of this document.

## 2. SALIENT FEATURES

1. The applicant, if employed, must send his application through the competent authority.
2. The date of initial registration of a scholar shall normally be the date on which he formally registers and deposits the fees for the first time for the Ph.D. programme; which shall also be the date of his joining the programme for all intents and purposes.
3. In case of change of status from full-time to part-time, the time spent as a full-time scholar will be taken into account suitably for the purpose of minimum registration period requirement.
4. If a scholar withdraws from his Ph.D. programme or his registration is terminated, his research scholar status ceases w.e.f. the date of such act.
5. Once a scholar is deregistered from the Ph.D. programme, he cannot apply again before the lapse of two years from the date of deregistration.
6. At the close of every semester, a scholar is required to submit his semester progress report by the due date to the Chairman of the DRC. The progress shall be evaluated by the DRC.
7. The scholar should be present in the Deptt. when a DRC meeting is held for evaluating the progress, or for comprehensive examination/presentation.
8. If due to compelling adverse circumstances (as considered so by the DRC), a scholar is not able to submit his progress report by the stipulated date, or the progress of a scholar is adjudged by the DRC as unsatisfactory, he, on his request, can be allowed an additional chance for the same. He will improve his work and



submit the report again at the close of the following semester (after six months). During this semester, he can be registered provisionally only (the normal semester fees, however, will have to be paid), and the minimum registration period requirement will automatically get extended by six months. Further, if he receives scholarship, his scholarship for these six months will be stopped.

Only one such chance can be allowed to a scholar during his entire Ph.D. programme.

If, even on having been granted extension, he does not submit the progress report within the stipulated time or on resubmission also, the progress is adjudged as unsatisfactory; his registration shall stand automatically cancelled.

9. A scholar must submit his research plan proposal and qualify the comprehensive examination within 3-12 months of the initial registration, failing which his registration can be cancelled.

10. If due to compelling adverse circumstances (as considered so by the DRC), a scholar is not able to submit his research plan proposal and appear in the comprehensive examination as stipulated above, or he is not able to pass the comprehensive examination within 12 months period, he, on his request, can be granted an extension of six months. During this semester, he can be registered provisionally only (the normal semester fees, however, will have to be paid), and minimum registration period requirement will automatically get extended by six months. Further, if he receives scholarship, his scholarship for these six months will be stopped.

Only one such chance can be allowed to a scholar.

11. The scholar must inform the HOD well in time (at least fifteen days in advance), through his supervisor(s), about his plans to appear in the comprehensive examination, to deliver pre-synopsis seminar, and to submit the synopsis and the thesis - all as per regulations.

12. A research scholar can submit his thesis only on having published at least two research papers out of his Ph.D. research work in refereed journals.

13. A research scholar is required to complete all the requirements for the award of the Ph D degree within the specified period as per the regulations.

14. Every research scholar is to abide by all the regulations and the amendments made from time to time.

15. It is the responsibility of the research scholar himself to be in the knowledge of the amendments (if any) in the ordinances and the regulations. No scholar will be informed individually; the related circulars/amendments would be available in the office of the HOD/ Dean. The amendments are incorporated in the prospectus and the amended version is put on the Institute web site also. He/she should maintain frequent contact with the supervisor for the purpose.

16. No TA/DA etc is admissible to any research scholar whenever he is to visit NITK, or any other place in connection with the Ph.D. research work.

17. In case of a change in the contact telephone number / correspondence address, the scholar must immediately inform his supervisor, the HOD, and the Dean.

## REGULATIONS

The following Regulations shall apply to all categories of candidates/ research scholars pursuing courses of study and research leading to the degree of Ph.D.

### R-1 CLASSIFICATIONS

The applicants/ scholars shall be classified in the following ways-

(A) On the basis of the time devotion to the Ph.D. programme-

i) **Full-time**

ii) **Part-time**

(B) On the basis of the occupation-

i) **Teacher**. i.e., a person on the faculty of a Deptt. of a teaching institute.

ii) **Non-teacher**

iii) **Project staff** A person working on a project undertaken by the Institute (NITK). The Ph.D. programme of such a person should be related to his project work.

(C) On the basis of the country he belongs to-

i) **Indian**

ii) **Foreign** nationals admitted through Embassy of the respective Govts. after getting approval from the Ministry of External Affairs and 'No Objection Certificate' from the Ministry of Human Resource Development, Department of Education, and Govt. of India or admitted under an MoU.

(D) On the basis of the financial assistance-

i) **Self-financed** A person who does not receive financial help like scholarship/ assistantship from NITK, or from any other source during his Ph.D. programme.

ii) **Fellowship/Scholarship Awardees**

(a) A research scholar getting NITK fellowship/ scholarship.

(b) A research scholar receiving fellowship/ scholarship from outside organizations such as CSIR, UGC, QIP, DST, AICTE etc. and not covered under (B) iii) above.

(c) A research scholar receiving fellowship/ scholarship from ICCR, Govt. of India. Such a person is sponsored by his parent Government and is admitted to the Ph.D. programme through Indian Embassy in his country.

### R-2 CONSTITUTION OF DEPARTMENT RESEARCH COMMITTEE

The DRC shall consist of the following, provided each qualifies to be a Ph.D. supervisor-

(i) HOD

(ii) All Professors of the Department

(iii) Three Associate Professors of the department by rotation. The term of an Associate Professor will be about 2 years, the changeover taking effect on July 1.



- (iv) Supervisors of the scholars. They do not, however, constitute the regular members (unless covered under (i) or (ii) or (iii)). They participate in DRC meetings only when the cases of their respective scholars are taken up. Also, the proposed supervisor is to be invited to participate in the DRC meeting when the case of his prospective candidate is taken up.

The HOD shall be the Chairman of the DRC. If the HOD does not qualify, the senior most qualifying faculty member of the Deptt. will act as the Chairman of the DRC. Faculty members, qualified to be supervisors, can only be members of DRC.

R-3

### ELIGIBILITY

#### R-3.1 Educational Qualifications:

An applicant possessing the following qualification shall be eligible for admission to a Ph.D. programme of the Institute (degrees obtained through distance education mode shall not be acceptable).

##### i) Engineering Stream-

(a) Master's degree (M.Tech./ M.E./ M.S.) or equivalent in appropriate discipline with a minimum CGPA of 7.0 or 65% marks in aggregate (of all the years/semesters of the course), preceded by a First Class Bachelor's degree in Engg./Tech.

Or

(b) Master's degree (M.Tech./ M.E./ M.S.) or equivalent in appropriate discipline with a minimum CGPA of 6.7 or 60% marks in aggregate (of all the years/semesters of the course) preceded by a First Class Bachelor's degree in Engg./Tech. and a minimum of 15 years of regular service in Govt. Organizations or educational institutes.

Or

(c) Bachelor's degree (B.Tech./ B.E.) in appropriate discipline, or equivalent, with a minimum CGPA of 9.5 or 90% marks in aggregate (of all the years/semesters of the course). Such a candidate has to clear compulsorily at least four theory courses of M. Tech. in relevant discipline, as decided by the DRC.

Or

(d) Bachelor's degree (B.Tech./ B.E.) in appropriate discipline, or equivalent, with a minimum CGPA of 7.6 or 70% marks in aggregate ( of all the years/ semesters of the course), and a minimum of 15 years of regular service in Govt. Organizations or teaching institutes of degree level. Such a candidate has to clear compulsorily at least four theory courses of M.Tech. in relevant discipline, as decided by the DRC.

##### ii) Sciences, Mathematics & Computer Applications Streams-

First Master's degree in the appropriate discipline, or equivalent, with a minimum CGPA of 7.0 or 65% marks in aggregate (of all the years/semesters of the course).



iii) **Humanities, Social Sciences & Management Streams-**

First Master's degree in the appropriate discipline, or equivalent, with a minimum CGPA of 6.7 or 60% marks in aggregate (of all the years/semesters of the course).

**R-3.2 Additional Eligibility Conditions for Part-Time Ph.D. Admission**

- a) The applicant should be an employee of an educational institute/org and must have completed on the last day of receiving applications, a minimum of two years of continuous service as at least a Lecturer or equivalent.
- b) The candidate proves to the satisfaction of the DRC that his/her official duties permit him to devote sufficient time to research.
- c) The candidate proves to the satisfaction of the DRC that facilities for pursuing research are available at his place of work in the chosen field of research.
- d) He will be required to visit NITK (on working days) to meet his supervisor in the Deptt. at least twice in each semester at intervals of not less than a month, and such visit be reported to the Chairman of the DRC for record.

**R-3.3 Eligibility for Institute Scholarship**

Only full-time Ph.D. research scholars are eligible for the award of the Institute scholarship.

A candidate/scholar is required to apply for scholarship. In a particular department, scholarships will be awarded only if these are available in that department.

The eligibility for scholarship and its amount will be as per the guidelines issued from time to time by the Ministry of Human Resources Development, Govt. of India and/or funding agency.

Those who are awarded scholarship from any other source will not be eligible for the Institute scholarship.

In case the semester research progress is unsatisfactory, the scholarship shall be discontinued/ stopped.

A Ph.D. research scholar receiving scholarship is required to devote at least eight hours per week towards the departmental or Institute work assigned to him/her by the HOD/ Director.

**R-4 RESERVATION/ RELAXATION**

**R-4.1** Fifteen percent (15%) scholarship (of the total sanctioned Institutional scholarships) shall be reserved for Scheduled Caste applicants and 7.5% for Scheduled Tribe applicants. A total of 3% scholarships, over and above the sanctioned strength, will be reserved for physically handicapped (PH) applicants in all the Ph.D. programmes of the Institute put together.

**R-4.2** For the SC/ST/physically handicapped applicants, the eligibility requirement of marks may be relaxed by 5%, or by an equivalent CGPA.



R-5

### SHORTLISTING and ADMISSION

- (a) The DRC will check the eligibility of the applicants.
  - (b) If considered necessary, the DRC may set short listing criteria, higher than the minimum eligibility as defined above.
  - (c) The basic guidelines/ instructions for short listing will be framed and issued by the DRC with a copy of the same to the Director.
  - (d) The short listing of applicants for the purpose of admission test/ interview will be done by the DRC.
  - (e) The eligible applicants will be tested by the DRC through seminar/ presentation/ test/ interview.
- In case a candidate is adjudged unfit for registration, he, if interested, can improve and apply afresh after a gap of minimum one semester.
- (f) The DRC will recommend the candidates to the Dean for registration.
  - (g) After getting the certificates checked, and the Dean's approval, the candidate may deposit the fees etc. The candidate must deposit his fees within 15 days of the Dean's approval or as notified by Dean, failing which the candidature shall stand cancelled.

All efforts should be made by the concerned Departments and the academic section that the registration process of Ph.D. candidates is completed within one month of the start of the semester.

R-6

### REGISTRATION

**R-6.1** A candidate is deemed to have been registered on completion of admission process for the 1<sup>st</sup> semester of the programme. Every scholar is required to deposit the fees and renew the registration every semester till the submission of the thesis. The renewal of registration every semester shall be subject to the satisfactory progress in his/ her research work as recommended by the DRC. If a scholar's progress is adjudged as unsatisfactory, the DRC may recommend notional registration; however such a chance can be allowed only once during the whole period. A scholar should deposit his semester registration fees only after having been notified by the Academic section that the concerned DRC has recommended his registration for that semester. The Academic section is to send the list of the duly registered scholars to the concerned Deptt. in the beginning of every semester.

#### **R-6.2 Time Period Requirement for Thesis Submission**

- a) The minimum period of registration shall be two years for a full-time scholar, and three years for a part-time scholar.
- b) The maximum time for the submission of the thesis for a full-time scholar is five years, and that for a part-time scholar is six years from the date of the initial registration for the Ph.D. programme. However, as a special case, on the recommendation of the Chairman of the DRC and the Dean, this limit may be extended up to a maximum period of seven years on yearly basis for both the categories by the Director, beyond which the registration shall stand cancelled automatically.



**R-7 THESIS SUPERVISOR(s)**

- R-7.1** Every registered scholar shall be assigned a research supervisor as approved by the DRC.
- R-7.2** Any regular full-time faculty member of the concerned Deptt. of the NITK holding a Doctorate degree and minimum two research papers published in the refereed journals, can be appointed a supervisor.
- R-7.3** Depending on the problem, a scholar may be assigned not more than three supervisors, designated as supervisor and co-supervisors. In no case, the number of co-supervisors shall be more than one from NITK.

**R-7.4 Appointment of alternative Supervisor**

A faculty member appointed as Ph.D. supervisor is normally expected to be available to the research scholar in the institute till the thesis is submitted. However, under unavoidable circumstances, such as long leave, resignation, retirement, or death; an alternative supervisor may have to be appointed. In such special cases, the appointment of the supervisor will be regulated as under:

**R-7.4.1 A Supervisor proceeds on leave of one month or more**

(i) If the synopsis of the thesis of the scholar has not yet been submitted,

a) and the supervisor proceeds on leave for one month or more but less than 18 months, then the supervisor should immediately inform the chairman DRC whether he will continue to guide and supervise the research work of his scholar effectively during his leave period or not. In case he does not inform within five days of the commencement of his leave, or informs that he will not be able to guide effectively, then he ceases to be the supervisor of that scholar.

b) and if at any point of time, the total period of long ( a month, or greater) leaves of the supervisor of a scholar equals or exceeds 18 months, that supervisor automatically ceases to be his/ her supervisor.

c) and if a supervisor proceeds on leave for 18 months or more, he ceases to be the supervisor.

d) and once a supervisor ceases to be the supervisor, he can not again become the supervisor of that scholar.

In above cases a); b), c) and d), when a supervisor ceases to be the supervisor, the other supervisor (of NITK) if there, shall act as the supervisor; and if there is no 'other' supervisor, the DRC shall immediately appoint alternative supervisor for the scholar.

(ii) If the thesis/ synopsis of the thesis has been submitted before the supervisor proceeds on leave,

and he consents to continue to be the supervisor, then he can continue to be so. If he declines, and there is no co-supervisor (of NITK), a caretaker supervisor will have to be appointed.

Further, if major revision becomes necessary, and the co-supervisor or the caretaker supervisor provides the required help in carrying out the major revision, he will automatically be treated as a supervisor of that candidate.



**R-7.4.2 A Supervisor retires**

A faculty member, who is due to retire within the next two years from the date the DRC meets to appoint a supervisor, can not be appointed a supervisor. If a faculty member on retirement informs that he shall continue effectively supervising the scholar, can continue as a supervisor, if either reemployed, or appointed Emeritus Fellow, or the synopsis of the thesis has been submitted, or the Director is convinced of his/her availability/continued guidance to the scholar and permits him to continue. If necessary, alternative/ caretaker supervisor be appointed by the DRC.

**R-7.4.3 A Supervisor resigns**

If necessary, alternative/ caretaker supervisor be appointed by the DRC.

**R-7.4.4 A Supervisor expires**

If necessary, alternative/ caretaker supervisor be appointed by the DRC.

**R-7.5** At no point of time there shall be more than six research scholars being supervised by any faculty member. A scholar being guided jointly will be counted as  $\frac{1}{2}$  irrespective of number of co-supervisors.

**R-8**

**COURSES AND CREDITS**

A research scholar shall have to meet the requirements of the courses and the credits as decided by the Senate from time to time.

DRC may appoint a three member RAC, under intimation to Dean, for a research scholar and may delegate some or all of its functions to RAC. The members of RAC shall be (i) Supervisor, (ii) A DRC member other than supervisors (iii) DRC member/ Co-supervisor/Outside Expert.

**R-9**

**COMPREHENSIVE EVALUATION**

**R-9.1** Every scholar is required to take comprehensive examination, which will test his comprehensiveness in broad field of research, and his academic preparation and potential to carry out the research. The comprehensive evaluation may be a combination of written and oral examinations, and may be separately conducted before evaluation of the research plan proposal. The written as well as the oral examination will be conducted by the DRC. Every scholar must pass the comprehensive examination within 3-12 months of his initial registration.

Every scholar is also required to submit his research plan proposal. The research plan proposal, giving a brief account of the related work already reported in the literature, should clearly spell out the objective; justify the need of the objective, and the methodology to be followed to achieve that objective. Subsequently, the research work should be carried out in accordance with the approved research plan.

**R-9.2** The following procedure is to be uniformly followed by all the Departments in conducting the comprehensive evaluation of the Ph.D. scholars.

- (a) The written examination should be conducted by the DRC.
- (b) The result of the written examination should be declared within two weeks as passed/ failed.



- (c) After the scholar has passed the written examination, the oral examination should be conducted by the DRC of the candidate.
- (d) After passing in the oral examination, the research proposal will be evaluated by the DRC through seminar.

**R-9.3 (a) Written and oral examination**

If a scholar fails in written/oral examination, he/she can reappear in the examination only after a period of three months.

**(b) Research Plan**

In case research plan is not approved by the DRC, the scholar will have to improve the research plan as per the suggestions of the DRC and get it reevaluated.

**R-9.4** A scholar will be allowed a maximum of two attempts to pass the comprehensive evaluation within 3-12 months.

**R-9.5** All the scholars must submit their research plan proposals, and qualify comprehensive evaluation between 3-12 months of their first registration, failing which their registration will be cancelled.

If due to compelling adverse circumstances (as considered so by the DRC), a scholar is not able to submit his research plan proposal and appear in the comprehensive examination as stipulated above, or he is not able to pass the comprehensive examination within 12 months period, he, on his request, can be granted an extension of six months. During this semester, he can be registered provisionally only (the normal semester fees, however, will have to be paid), and minimum registration period requirement will automatically get extended by six months. Further, if he receives scholarship, his scholarship for these six months will be stopped.

Only one such chance can be allowed to a scholar.

**R-10 PERFORMANCE MONITORING**

**R-10.1** The academic/research progress of each scholar will be monitored by the DRC. For this purpose, at the end of each semester, a scholar is required to submit through his supervisor the semester progress report, clearly highlighting the work carried out during that semester. The progress report, giving appropriate headings, must cover i) summary of the work done and results obtained before the start of the semester under report, ii) the goal set for this semester, iii) the methodology used in achieving the goal, and iv) the extent of the fulfillment of the goal.

When a DRC meeting is held for evaluating the progress, or for comprehensive examination/ presentation, the scholar should be present in the Deptt. The DRC will evaluate the progress reports of the scholars through seminar/ presentation/ interview/ discussion.

**R-10.2** The Chairman DRC in the Department will coordinate, every semester, the collection of progress reports written and signed by the scholars and forwarded by the supervisor.



**R-10.3** If due to compelling adverse circumstances (as considered so by the DRC), a scholar is not able to submit his progress report by the stipulated date, or the progress of a scholar is adjudged by the DRC as unsatisfactory, he, on his request, can be allowed an additional chance for the same. He will progress/improve his work and submit the report again at the close of the following semester (after six months). During this semester, he can be registered provisionally only (the normal semester fees, however, will have to be paid), and the minimum registration period requirement will automatically get extended by six months. Further, if he receives scholarship, his scholarship for these six months will be stopped.

Only one such chance can be allowed to a scholar during his entire Ph.D. programme.

If, even on having been granted extension, he does not submit the progress report within the stipulated time or on resubmission also, the progress is adjudged as unsatisfactory, his registration shall stand cancelled and he is no more a research scholar of the Institute.

**R-10.4** The cases where some punitive action is taken will be reported to the Director.

## **R-11 SEMINAR/ SYNOPSIS/ PANEL OF EXAMINERS**

### **R-11.1 Seminar**

- a) The DRC shall assess the work of the scholar through a pre-synopsis seminar, which will be held not earlier than 18 months for full-time, and 24 months for part-time scholars from the date of passing comprehensive evaluation.
- b) The schedule of the pre-synopsis seminar shall be notified well in advance (at least three days in advance) so as to enable the interested staff members and the students to attend it.

### **R-11.2 Synopsis**

The scholar will submit the synopsis only on supervisor's satisfaction on quality of the work. The synopsis should precisely reflect all aspects of the research work to be included in the thesis.

- a. On completion of the research work the candidate shall submit to the Chairman DRC through his supervisor, 8 copies of the synopsis in the same format as specified for the thesis. The DRC will examine the synopsis, and the Chairman DRC shall forward the synopsis with its recommendations to the Dean.
- b. The synopsis should be submitted normally within 2 months after the presentation of pre-synopsis seminar. In case the synopsis is not submitted in the specified period, the scholar may be asked to present another pre-synopsis seminar.
- c. The scholar shall submit the synopsis of his/her work normally at least one month before submitting the thesis.



- d. The scholar shall be required to submit fresh synopsis if he/ she fails to submit his/her thesis within 8 months of the submission of the earlier synopsis. However, in case a scholar fails to submit his/ her thesis within the stipulated time and has suitable justification for the same, the Director may on recommendations of the DRC and on individual merits of each case grant him/her extension in time of not more than two months, i.e., the scholar may be allowed to submit his/her thesis within a period normally not exceeding 10 months from the date of the submission of the synopsis. However, the thesis should be submitted within the prescribed time limit as per regulations.

### R-11.3 Panel of Examiners

A panel of at least ten external experts, including foreign experts, and the authors of the recent papers in the references cited by the scholar in the area of his Ph.D. work would be suggested to the DRC by the Supervisor. The DRC will consider the suggested panel and will finally recommend to the BOS a panel of ten external examiners, which will include at least three examiners from outside India, from advanced/developed countries and the rest from India, preferably from the Institutes of repute. The DRC shall also recommend the internal examiner, who normally would be the scholar's supervisor. The recommended panel will be considered and approved/ modified by BOS.

R-12

### BOARD OF EXAMINERS

On receipt of the title and synopsis of the thesis, the Director will appoint a Board of Examiners for each candidate from the list approved by the BOS. The Board of examiners will consist of one internal examiner, and two external examiners, one out of which **would be from within India, and the other from abroad**. These external examiners shall be chosen normally from the panel of examiners recommended by the BOS as aforesaid. A person working in the same organization(s)/ institute(s) where the research scholar is employed cannot, however, be appointed as External Examiner for that research scholar.

For evaluating the thesis, an honorarium at the rate of Rs. 3000/-per thesis is payable to the Indian external examiner and at the rate of US \$ 200/- or equivalent is payable to the foreign external examiner. The viva-voce examination of the scholar will be conducted by the Indian external examiner, who will be paid an additional honorarium of Rs. 2000/-.

An examiner will be reimbursed TA/DA as per the Institute (NITK) rules. He will also be reimbursed all associated correspondence expenses incurred by him for the purpose of examination.

R-13

### THESIS SUBMISSION

- R-13.1 The scholar will submit a soft copy of the thesis in PDF format on CD, and four unbound copies with soft covers, typed in English, one and a half spaced, printed in Times New Roman 12 pt. or Arial 11 pt. on both sides of A-4 size papers, having margins 1.25" – left, 1.0" – right, 1.0" – top and 1.0" - bottom, along with the examination form and the examination fee of Rs. 5000/-. The examination form will be available with the COE.



**R-13.2** The thesis shall contain a critical account of the research carried out by the scholar. It should be characterized by discovery of facts or fresh approach towards interpretation of facts and theories or significant contribution to knowledge or development or a combination of these. It should bear evidence of the scholar's capacity for analysis and judgment as well as ability to carry out independent investigation, design or development.

No part of the thesis or supplementary published work should have been submitted for the award of any other degree or diploma.

A research scholar can submit his thesis only on having published at least two research papers out of his Ph.D. research work in refereed journals.

**R-13.3** A candidate can submit his/her thesis within the time period as stipulated in regulations provided that he/she has completed the minimum period of registration.

#### **R-14**           **THESIS EVALUATION**

All correspondence/ notifications in regard to thesis evaluation and viva-voce examination of the scholar (except where stated otherwise) shall be done by the Controller of Examinations. Except for the correspondence with the candidate or general circulars/ notifications, the correspondence shall be confidential.

**R-14.1** Each examiner will be requested to submit a detailed assessment report and his/her recommendation within six weeks of the date of receiving the thesis.

i) The examiners will examine the thesis individually with a view to judge that the thesis is a piece of research work characterized by:

- a) The discovery of facts, or
- b) A fresh approach towards interpretation and application of facts or theories, or
- c) A distinct advancement in technology.

ii) Each examiner is required to give his/her opinion about candidate's capacity for critical examination and sound judgment. The examiner will submit the report to the Controller of Examinations on the prescribed form supplied by him clearly recommending that:

- a) The thesis is accepted for the award of the Ph.D. degree subject to the candidate's giving satisfactory answer to the queries specifically mentioned in the report, at the time of Viva-Voce examination, or
- b) The candidate be asked to resubmit his/her thesis in the revised form, or
- c) The thesis be rejected.

**R-14.2** In the event of the thesis report not being received from an examiner within a period of three months from the date of dispatch, the Director may approve alternate examiner in his place for evaluating the thesis from the approved list of examiners. Before corresponding with the alternate examiner, the original



examiner must be informed by the COE of the cancellation of his appointment, stating the reason therein.

**R-14.3 a)** If all the three examiners give the same recommendation, i.e., acceptance, or revision, or rejection: that recommendation shall be accepted.

**b)** If any two of the three examiners recommend rejection, the thesis shall be rejected.

**c)** If one examiner recommends acceptance, and the other two recommend revision, the recommendation 'revision' is accepted.

**d)** If one examiner recommends rejection, then the comments and the recommendation made by the other two examiners be sent to that examiner and his/her revised clear verdict sought. That examiner may then recommend acceptance, or revision, or rejection.

(i) If the two examiners had recommended acceptance, and

(a) the revised verdict of the third is acceptance; the thesis is accepted.

(b) the revised verdict of the third is revision, or rejection; the fourth examiner will be appointed for evaluating the thesis.

(ii) If the two examiners had recommended revision, and

(a) the revised verdict of the third is revision, or acceptance; the recommendation 'revision' is accepted.

(b) the revised verdict of the third remains rejection; the fourth examiner will be appointed for evaluating the thesis.

(iii) If one of the two examiners had recommended acceptance, and the other, revision; and

(a) the revised verdict of the third is revision, or acceptance; the recommendation 'revision' is accepted.

(b) the revised verdict of the third remains rejection; the fourth examiner will be appointed for evaluating the thesis.

**e)** If one examiner recommends revision, and the other two recommend acceptance, then the comments and the recommendation made by the other two examiners be sent to that examiner and his/her revised clear verdict sought. That examiner may then recommend acceptance, or revision.

(a) If the revised verdict of the third is acceptance; the thesis is accepted,

(b) If the revised verdict of the third remains revision; the fourth examiner will be appointed for evaluating the thesis.

**R-14.4** The fourth examiner, if required, would be appointed by the Director from the panel of the examiners already approved. The new (fourth) examiner shall be Indian or Foreigner depending on whether the thesis was recommended to be rejected/revised by an Indian or a foreign examiner in the first instance. The reports of all the examiners will be sent to him/ her without revealing the identity of the examiners, along with the response of the candidate, if any, to these. The decision accept, revise, or reject will be taken as follows, keeping in view his recommendations.



For R-14.3 d) (i) (b) - the recommendation of the fourth examiner shall be accepted.

For R-14.3 d) (ii) (b) - if the recommendation of the fourth examiner is acceptance, or revision, the thesis is to be revised. If the recommendation is rejection, the thesis shall be rejected.

For R-14.3 d) (iii) (b), if the recommendation of the fourth examiner is acceptance, or revision, the thesis is to be revised. If the recommendation is rejection, the thesis shall be rejected.

For R-14.3 e) (b), if the recommendation of the fourth examiner is rejection, or revision, the thesis is to be revised. If the recommendation is accept, the thesis shall be accepted.

Any doubt arising out of the procedure laid down above shall be referred to the Director for a decision.

#### **R-15 RESUBMISSION**

When a thesis is to be revised and resubmitted, the scholar should be informed about the comments of the examiners. The revised thesis is to be submitted within one year, but not earlier than three months.

A fresh fee for the examination shall be paid by the scholar.

The revised version of the thesis will be sent to all the examiners for their fresh recommendations.

#### **R-16 VIVA-VOCE EXAMINATION**

On receipt of the thesis examination reports from the examiners, the COE shall send all such reports to the Director for further necessary action. The Director, on the basis of the reports will decide whether the candidate should be allowed to appear in the viva-voce examination or not. The Director will send back the reports, along with his decision to the COE for further action in the matter of examination. The Director's decision on the thesis reports shall be communicated by the COE to the scholar, and the Chairman DRC. The COE will intimate names and addresses of the external and internal examiners for the candidate, and the examiners' reports to the HOD.

**R-16.1** On having been allowed to appear in the Viva-voce examination, the scholar is to defend his/her work/thesis orally before a Committee of the examiners comprising one internal and one Indian external examiner. The DRC Chairman will coordinate with the external examiner, the internal examiner, and the scholar and will fix a date for holding the viva-voce examination and inform them accordingly. The questions/queries specified by the thesis examiners in their reports shall be intimated to the candidate through his/her supervisor at least one week before the date of conduct of the viva-voce examination. The schedule of the viva-voce examination shall be adequately notified so as to enable interested staff members and students to attend it.

**R-16.2(i)** In case of non-availability of the Indian External Examiner for conducting the viva-voce examination, the Director may appoint alternate examiner to conduct the viva-voce examination from the existing panel.



If the need be, the DRC may suggest a fresh panel of examiners.

- (ii) The viva-voce examiners shall be provided with the reports of the thesis examiners before the viva-voce examination.
- (iii) The internal examiner shall assist the HOD in arranging the viva-voce examination of the candidate as early as possible.
- (iv) In case of the inability of the internal examiner to have the viva-voce examination conducted due to any reason whatsoever, the Director may appoint another internal examiner, to conduct the viva-voce examination, from amongst the faculty of the department concerned who belongs to the particular field in consultation with Chairman DRC. In such cases also, the Ph.D. work will be deemed to have been carried out under the guidance of the supervisor (s) only.
- (v) After the viva-voce examination, both the examiners will prepare a detailed joint report giving one of the following three recommendations.
  - (a) recommended for the award of the degree
  - (b) the thesis be resubmitted after a minimum period of six months incorporating the suggestions of the examiners.
  - (c) not recommended for the award of the degree

The report shall be sent in a confidential cover to the COE under intimation to the HOD.

- (vi) Any other matter not explicitly provided herein or of an exceptional nature, may be referred to the Director for his/her decision.

R-17

#### **AWARD OF THE Ph.D. DEGREE**

On the completion of all stages of the examination, a Committee consisting of the Director, the Dean Academic and the Chairman of the DRC concerned shall examine the reports of all the examiners (thesis and viva-voce) and decide as under: -

- (a) that the degree be awarded;
- (b) that the degree shall not be awarded.
  - i) The thesis is to be resubmitted.
  - ii) The thesis is rejected on the conclusion that the thesis is not genuinely the work of the candidate.

For (b) i) above, the Committee, if required, shall provide to the candidate a list of all corrections and modifications to be made in the thesis, including suggestions made by the examiners during the thesis evaluation, and the result of the candidate will be declared after the candidate submits two copies of the corrected thesis certified by the internal examiner that the necessary corrections and modifications have been made.



R-18

### INSTITUTIONAL SCHOLARSHIP

R-18.1 Those candidates who are admitted on full-time basis are considered on request for the award of Institutional scholarship of the amount as decided by the Board of Governors and directed by the Government of India from time to time. The scholar must submit a certificate to the effect that he is not in receipt of any financial aid from any other source for pursuing the Ph.D. research work. The scholars getting Institutional scholarships are required to provide 8 hrs of work per week as directed by the HOD/ Director.

A scholar is liable to refund whole of the financial assistance/scholarship received if he abandons and leaves his Ph.D. work without completing it.

R-18.2 In addition, the scholars will be provided contingency grant in accordance with the rules of the Institute.

It is to be noted that admission to the Programmes and award of scholarship are not linked. Admission to a programme does not guarantee the award of scholarship. Those who are not awarded scholarship can continue with the programmes as self-financed scholars.

The Institute may provide fee waiver subject to the final approval of Director on the recommendation of DRC & Dean

R-19

### LEAVE AND ATTENDANCE

All full-time research scholars are required to mark their daily attendance in the attendance register maintained by the Deptt. The Chairman DRC shall also maintain a proper leave account of each such scholar. The leave of a scholar should be recommended by his Supervisor and shall be sanctioned by the Chairman DRC.

A full-time research scholar is entitled to avail leave as per Leave and Attendance Rules formulated and amended from time to time by the Senate. Presently these are as under:

A full-time Ph.D. scholar during his/ her stay at the Institute will be entitled to leave of 30 days including leave on medical grounds, per academic year. He/ she will not be entitled to mid-semester breaks/vacations, summer and winter vacation.

Leave beyond 30 days in an academic year may be granted to a Research Scholar in exceptional cases, subject to the following conditions:

- (i) the leave beyond 30 days will be without scholarship and
- (ii) such an extension of leave upto additional 30 days will be granted only once during the programme of the scholar.

The women research candidate will be eligible for Maternity Leave of one month once during the tenure of the award.



**CANCELLATION OF REGISTRATION**

Registration of a candidate can be cancelled in any one of the following eventualities, with due approval of the Director.

- (i) if he/ she absents himself/ herself for a continuous period of four weeks without prior intimation/ sanction of leave.
- (ii) if he /she resigns from the Ph.D. programme.
- (iii) if he/she fails to renew his/ her registration within 4 weeks of the start of the semester as per provision contained in these Ordinances & Regulations.
- (iv) if he/ she does not submit his/ her semester progress report by the stipulated date or his/ her academic progress is found unsatisfactory.
- (v) If he/ she does not clear the comprehensive evaluation as stipulated.
- (vi) If he/ she is found involved in an act of misconduct and/ or indiscipline and a competent authority has recommended termination. For all purposes, the conduct/ discipline rules applicable to B.Tech./ M.Tech. students of the Institute shall apply to Ph.D. research scholars also.
- (vii) If at any stage, information furnished by the scholar in his application is found false or incorrect.

**GENERAL**

- R-21.0** All accepted Ph.D. thesis shall be got uploaded on Institute website within Four weeks of acceptance by HOD.
- R-21.1** Notwithstanding anything contained in these Ordinances & Regulations, all categories shall be governed by the rules and procedures framed by the Senate, and in force from time to time.
- R-21.2** Any doubt or dispute about the interpretation of these Ordinances and Regulations shall be referred to the Director whose decision shall be final.
- R-21.3** Eligibility for admission to Ph.D. programmes in different disciplines may, from time to time, be reviewed, approved by the Senate, and implemented.
- R-21.4** All exceptions and issues not covered above may be decided by a committee consisting of the Director, the Dean, the HOD and the Supervisor(s) of the candidate concerned subject to subsequent ratification by the Senate.



ACADEMIC CALENDAR (SESSION 2010 - 2011)**ODD SEMESTER**

|     |   |  |
|-----|---|--|
| 1.  | Registration  | 14 to 16 July 2010 (Wednesday to Friday )                |
| 2.  | Teaching Commences  | 19.7.2010 (Monday)                                       |
| 3.  | Last Date for late registration with late fee of Rs. 250/- with the permission of Dean Academic | 26.7.2010 (Monday)                                       |
| 4.  | Mid-Semester Exam.-I  | 26.08.2010 (Thursday) to 28.08.2010 (Saturday)           |
| 5.  | Mid Semester Vacation   | 04.10.2010 (Monday) to 08.10.2010 (Friday)               |
| 6.  | Mid-Semester Exam-II  | 18.10.2010(Monday) to 20.10.2010(Wednesday)              |
| 7.  | Mid-Semester Exam.-III  | May be arranged by the teachers as per their convenience |
| 8.  | Teaching closes   | 04.11.2010 (Thursday)                                    |
| 9.  | End Semester Exams. begin   | 15.11.2010 (Monday)                                      |
| 10. | Winter Vacation   | 29.11.2010 (Monday) to 10.12.2010 (Friday)               |
| 11. | Declaration of Result   | By the end of December 2010                              |

**EVEN SEMESTER**

|     |   |  |
|-----|---|--|
| 1.  | Registration  | 22.12.2010 to 24.12.2010 (Wednesday to Friday)           |
| 2.  | Teaching Commences  | 27.12.2010 (Monday)                                      |
| 3.  | Last Date for late registration with late fee of Rs. 250/- with the permission of Dean Academic | 03.01.2011 (Monday)                                      |
| 4.  | Convocation   | First Fortnight of January 2011                          |
| 5.  | Literati-2011   | 27.01.2011(Thursday) to 30.01.2011(Sunday)               |
| 6.  | Mid-Semester Exam.-I  | 03.02.2011 (Thursday) to 05.02.2011 (Saturday)           |
| 7.  | Confluence-2011   | 17.02.2011 (Thursday) to 20.02.2011 (Sunday)             |
| 8.  | Athletic Meet   | 25.02.2011 ( Friday) to 27.02.2011 (Sunday)              |
| 9.  | Mid Semester Vacation   | 14.03.2011 (Monday) to 18.03.2011 (Friday)               |
| 10. | Mid-Semester Exam-II  | 28.03.2011(Monday) to 30.03.2011(Wednesday)              |
| 11. | Mid-Semester Exam.-III  | May be arranged by the teachers as per their convenience |
| 12. | Teaching closes   | 29.04.2011 (Friday)                                      |
| 13. | End Semester Exams. begin   | 09.05.2011 (Monday)                                      |
| 14. | Summer Vacation   | 23.5.2011 (Monday) to 08.07.2011 (Friday)                |
| 15. | Practical Training begins   | 30.05.2011 (Monday)                                      |
| 16. | Declaration of Result   | By the end of June 2011                                  |



B. TECH. (3<sup>rd</sup> SEMESTER) MECHANICAL ENGINEERING  
MET-203 STRENGTH OF MATERIALS-I

| L | T | P/D | Cr  |
|---|---|-----|-----|
| 3 | 1 | -   | 3.5 |

1. **Simple Stress and Strain**

Concept of stress and strain, normal and shear stresses, Hooke's law, principle of St. Venant, Modulus of elasticity, Modulus of rigidity, stress-strain diagram, elongation due to self weight, column of uniform strength, composite sections, statically indeterminate systems, temperature stresses, strain analysis, Poisson's ratio, volumetric strain, factor of safety, tensile test diagram, elastic constants, relation between elastic constants. (6 hrs)

2. **Compound Stress and Strain**

Stresses on an inclined plane, principal stresses and principal planes, Mohr's stress circle, three coplanar stresses, ellipse of stress, strain analysis, principal strains, Mohr's strain circle, principal stresses from principal strains. (5 hrs)

3. **Strain Energies and Theory of Failures**

Strain energy, resilience, strain energy in 3-D system, shear strain energy, shear strain energy in 3-D system, stresses due to various types of loading, Different theories of failure, significance, graphical representation. (5 hrs)

4. **Shear Force and Bending Moment Diagrams**

Types of supports and beams, shear force, bending moment, relation between load, shear force and bending moment, shear force and bending moment diagrams for various types of loading and supports, maximum bending moment and point of contraflexure, loading and bending moment diagrams from shear force diagrams. (5 hrs)

5. **Bending Stress in Beams**

Stresses due to simple bending, moment of inertia, beams with uniform bending strength, composite or flitched beams, unsymmetrical bending, determination of principal axes, ellipse of inertia, combined direct and bending stress, middle-third and middle-quarter rules. (6 hrs)

6. **Shear Stress in Beams**

Shear stress distribution, Variation of shear stress in beams of various sections, any combination of sections subjected to shear force, built up beams, shear centre. (5 hrs)

7. **Slope and Deflection**

Beam differential equation, slope and deflection at a point, double integration method, Macaulay's method, moment-area method, strain energy methods, Castigliano's theorem, conjugate beam method, Maxwell's reciprocal theorem, deflection of beams due to shear stress. (8 hrs)



### Reference Books:

1. G H Ryder, "*Strength of Materials*", ELBS.
2. S S Rattan, "*Strength of Materials*", Tata McGraw Hill, India.
3. Beer P F and Johnston (Jr) E R, "*Mechanics of Materials*", SI Version, Tata McGraw Hill, India.
4. Sadhu Singh "*Strength of Materials*", Khanna Publishers.
5. Popov E P, "*Engineering Mechanics of Solids*", SI Version, Prentice Hall of India, New Delhi.
6. Timoshenko S P and Young D H, "*Elements of Strength of Materials*", East West Press, New Delhi.



B. TECH. (3<sup>rd</sup> SEMESTER) MECHANICAL ENGINEERING  
MET-204 STRENGTH OF MATERIALS-II

| L | T | P/D | Cr  |
|---|---|-----|-----|
| 3 | 1 | -   | 3.5 |

1. **Fixed and Continuous Beams**

Fixed beams, continuous beams and overhanging beams, moment-area method, Macaulay's method, Clapeyron's three moment equation, moment distribution method, slope and deflection of propped (elastic and rigid) cantilevers and beams subjected to point loads and/or uniformly distributed loads. (6 hrs)

2. **Bending of Curved Bars**

Stresses in bars of small initial curvature, Stresses in bars of large initial curvature, Winkler-Bach theory, stresses in crane hooks, circular hooks, circular rings, simple chain links, deflection of curved bars, crane hooks, rings, and simple chains. (5 hrs)

3. **Torsion**

Circular shafts, power transmission, Shear stresses in hollow and solid shafts, shafts in series and parallel, Stepped and composite shafts, shafts subjected to combined bending and twisting loads, equivalent twisting and bending moments, strain energy in torsion, Bredt-Batho theory, thin-walled sections, thin rectangular members. (6 hrs)

4. **Springs**

Closed-coiled helical springs subjected to axial loads and couples, springs in series and parallel, concentric springs, stresses and deflections in open-coiled helical springs subjected to axial loads, and/or twisting couples, stresses and deflections in leaf springs, flat spiral springs. (5 hrs)

5. **Columns and Struts**

Columns under axial load, concept of instability and buckling, slenderness ratio, various end conditions, Euler's theory for initially straight columns, assumptions and limitations, empirical formulae, stresses and deflections in eccentrically loaded straight long columns, secant formula, stresses and deflections in struts with initial curvature and in straight long columns with transverse loads for different end conditions. (6 hrs)

6. **Cylinders and Spheres**

Thin cylinders subjected to internal pressure, Circumferential and longitudinal stresses and strains, Maximum shear stress, thin spherical shells subjected to internal pressure, wire winding of thin cylinders, Lamé's theory, thick cylinders subjected to internal and external pressures, compound cylinders, stresses and strains in thick spherical vessels subjected to internal and external pressures. (6 hrs)



7. **Rotating Discs and Cylinders**

Stresses and strains in rotating rims or rings of uniform thickness, stresses and strains in rotating thin solid and hollow discs of uniform thickness, stresses and strains in rotating thin disc of uniform strength, stresses and strains in rotating solid and hollow cylinders.

(6 hrs)

**Reference Books:**

1. G H Ryder, "*Strength of Materials*", ELBS.
2. S S Rattan, "*Strength of Materials*", Tata McGraw Hill, India.
3. Beer P F and Johnston (Jr) E R, "*Mechanics of Materials*", SI Version, Tata McGraw Hill, India.
4. Sadhu Singh "*Strength of Materials*", Khanna Publishers.
5. Popov E P, "*Engineering Mechanics of Solids*", SI Version, Prentice Hall of India, New Delhi.
6. Timoshenko S P and Young D H, "*Elements of Strength of Materials*", East West Press, New Delhi.

B. TECH. (3<sup>rd</sup> SEMESTER) IEM  
IEM-203 STRENGTH OF MATERIALS

| L | T | P/D | Cr  |
|---|---|-----|-----|
| 3 | 1 | -   | 3.5 |

- 1. Simple Stresses and Strains**  
Concept of stress and strain, Normal and shear stresses, Hooke's law, Modulus of elasticity, modulus of rigidity, stress-strain diagram, elongation due to self weight, column of uniform strength, composite sections, statically indeterminate systems, temperature stresses, strain analysis, Poisson's ratio, Volumetric strain, factor of safety, tensile test diagram, elastic constants, relation between elastic constants. (5 hrs)
- 2. Compound Stresses and Strains**  
Stresses on an inclined plane, principal stresses and principal planes, Mohr's stress circle, three coplanar stresses, ellipse of stress, strain analysis, principal strains. (4 hrs)
- 3. Strain Energies and Theory of Failures**  
Strain energy, resilience, strain energy in 3-D system, shear strain energy, shear strain energy in 3-D system, stresses due to various types of loading, Different theories of failure, significance, graphical representation. (4 hrs)
- 4. Bending Moment and Shear Force Diagrams**  
Types of supports and beams, shear force, bending moment, relation between load, shear force and bending moment, shear force and bending moment diagrams for various types of loading and supports, maximum bending moment and point of contraflexure. (4 hrs)
- 5. Stresses in Beams**  
Stresses due to simple bending, moment of inertia, beams with uniform bending strength, composite or flitched beams, shear stress distribution, variation of shear stress in beams of various sections. (5 hrs)
- 6. Slope and Deflection**  
Beam differential equation, slope and deflection at a point, double integration method, Macaulay's method, moment-area method, Castigliano's theorem. (5 hrs)
- 7. Torsion**  
Derivation of torsion equation and its assumptions, applications of the equation to the hollow and solid circular shafts, torsional rigidity, combined torsion and bending of circular shafts, close-coiled-helical springs. (4 hrs)
- 8. Thin cylinders and spheres**  
Thin cylinders subjected to internal pressure, circumferential and longitudinal stresses and strains, maximum shear stress, increase in diameter and volume of vessel, Thin spherical shells subjected to internal pressure, wire winding of thin cylinders. (5 hrs)