Sri Krishnadevaraya University College of Engineering & Technology
Ananthapuramu – 515 003 (A.P) India
Civil Engineering

Draft Academic Regulations of M.Tech. (Full Time/Regular) Programme (Effective for the students admitted into M.Tech. I year from the Academic Year 2025-26 onwards)

Sri Krishnadevaraya University College of Engineering & Technology offers **Two** Years (**Four** Semesters) full-time Master of Technology (M.Tech.) Degree programme, under Choice Based Credit System (CBCS) in different branches of Engineering and Technology with different specializations.
Sri Krishnadevaraya University College of Engineering & Technology, Ananthapuramu shall confer M. Tech. degree on candidates who are admitted to the programme and fulfil all the requirements for the award of the degree.

1. **Award of the M.Tech. Degree**
   A student will be declared eligible for the award of the M.Tech. Degree if he/she fulfils the following:
   1.1 Pursues a course of study for not less than two academic years and not more than four academic years.
   1.2 Registers for 70 credits and secures all 70 credits.

2. Students, who fail to fulfil all the academic requirements for the award of the degree within four academic years from the year of their admission, shall forfeit their seat in M.Tech. course and their admission stands cancelled.

3. **Programme of Study:**

   The following M.Tech Specializations are offered at present in different branches of Engineering and Technology:

S.No.	Branch	Name of the Specialization
01	Computer Science and Engineering	Computer Science and Engineering
02	Electronics and Communication Engineering	Embedded Systems & VLSI Design
03	Electrical and Electronics Engineering	Electrical Power Systems
04	Mechanical Engineering	Thermal Engineering
05	Civil Engineering	Structural Engineering

4. **Eligibility for Admissions**:
   4.1 Admission to the M. Tech Program shall be made subject to the eligibility, qualification and specialization prescribed by the A.P. State Government/University from time to time.
   4.2 Admissions shall be made either on the basis of the merit rank or Percentile obtained by the qualified student in the relevant qualifying GATE Examination/ the merit rank obtained by the qualified student in an entrance test conducted by A.P. State Government (APPGECET) for M.Tech. programmes/an entrance test conducted by University/on the basis of any other exams approved by the University, subject to reservations as laid down by the Govt. from time to time.

5. **Programme related terms:**
   5.1 ***Credit:*** A unit by which the course work is measured. It determines thenumber of

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hours of instructions required per week. One credit is equivalent to one hour of teaching (Lecture/Tutorial) or two hours of practical work/field work per week.
Credit definition:

1Hr.Lecture(L) per week	1 credit
1Hr.Tutorial(T) per week	1 credit
1Hr.Practical(P)per week	0.5credit

5.2 ***Academic Year:*** Two consecutive (one odd + one even) semesters constitute one academic year.

5.3 ***Choice Based Credit System (CBCS):*** The CBCS provides choice for students to select from the prescribed courses.

6. Programme Pattern:

6.1 Total duration of the M.Tech. programme is two academic years

6.2 Each academic year of study is divided into two semesters.

6.3 Each Semester shall be of 22 weeks duration (inclusive of Examinations), with a minimum of 90 instructional days per semester.

6.4 The student shall not take more than four academic years to fulfil all the academic requirements for the award of M.Tech. degree from the date of commencement of first year first semester, failing which the student shall forfeit the seat in M.Tech. programme.

6.5 The medium of instruction of the programme (including examinations and project reports) will be in English only.

6.6 All subjects/courses offered for the M.Tech. degree programme are broadly classified as follows:

S.No.	Broad Course Classification	Course Category	Description
1.	Core Courses	Foundational &Professional Core Courses (PC)	Includes subjects related to the parent discipline/ department/ branch of Engineering
2.	Elective Courses	Professional Elective Courses(PE)	Includes elective subjects related to the parent discipline/ department/ branch of Engineering
		Open Elective Courses (OE)	Elective subjects which include inter-disciplinary subjects or subjects in an area outside the parent discipline which are of importance in the context of special skill development
3.	Research	Research Methodology &IPR	To understand importance and process of creation of patents through research
		Technical Seminar	Ensures preparedness of students to undertake major projects/ Dissertation, based on core contents related to specialization
		Co curricular Activities	Attending conferences, scientific Presentations and other scholarly activities
		Dissertation	M.Tech. Projector Major Project
4.	Audit Courses	Mandatory non credit courses	Covering subjects of developing desired attitude among the learners is on the line of initiatives such as Unnat Bharat

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			Abhiyan, Yoga, Value education etc.

6.7 The college shall take measures to implement Virtual Labs (https://www.vlab.co.in) which provide remote access to labs in various disciplines of Engineering and will help student in learning basic and advanced concept through remote experimentation. Student shall be made to work on virtual lab experiments during the regular labs.

6.8 A faculty advisor/mentor shall be assigned to each specialization to advise students on the programme, its Course Structure and Curriculum, Choice of Courses, based on his competence, progress, pre-requisites and interest.

6.9 Preferably 25% course work for the theory courses in every semester shall be conducted in the blended mode of learning.

7. Attendance Requirements:

7.1 A student shall be eligible to appear for the University external examinations if he/she acquires 75% of attendance in aggregate of all the courses.

7.2 Condonation of shortage of attendance in aggregate up to 10% (65% and above and below 75%) in each semester may be granted by the College Academic Committee.

7.3 Condonation of shortage of attendance shall be granted only on genuine and valid reasons on representation by the candidate with supporting evidence

7.4 Students whose shortage of attendance is not condoned in any semester are not eligible to take their end examination of that class.

7.5 A stipulated fee shall be payable towards condonation of shortage of attendance.

7.6 A student will not be promoted to the next semester unless he satisfies the attendance requirements of the present semester. They may seek re-admission into that semester when offered next.

7.7 If any candidate fulfils the attendance requirement in the present semester, he shall not be eligible for readmission into the same class.

7.8 If the learning is carried out in blended mode (both offline & online), then the total attendance of the student shall be calculated considering the offline and online attendance of the student.

8. Evaluation – Distribution and Weightage of Marks:

The performance of a student in each semester shall be evaluated subject - wise (irrespective of credits assigned), for a maximum of 100 marks for theory and 100 marks for practical, based on Internal Evaluation and End Semester Examination.

8.1 There shall be five units in each of the theory subjects. For the theory subjects 60 marks will be for the End Examination and 40 marks will be for Internal Evaluation.

8.2 Two Internal Examinations shall be conducted for 30 marks each, one in the middle of the Semester and the other immediately after the completion of instruction. First mid examination shall be conducted for I & II units of the syllabus and second mid examination for III, IV &V units. Each mid exam shall be conducted for a total duration of 120 minutes with 3 questions (without choice) eachquestionfor10marks. Final Internal marks for a total of 30 marks shall be arrived at by considering the marks secured by the student in both the internal examinations with 80% weightage to the better internal exam and 20% to the

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other. There shall be two online examinations conducted duringtherespectivemidexaminationsbythecollegefortheremaining10 marks with 20 objective questions.

8.3 The following pattern shall be followed in the End Examination:
- i. Five questions shall be set from each of the five units with either/or type for 12 marks each.
- ii. All the questions have to be answered compulsorily.
- iii. Each question may consist of one, two or more bits.

8.4 For practical subjects, 60 marks shall be for the End Semester Examinations and 40 marks will be for internal evaluation based on the day-to-day performance. The internal evaluation based on the day-to-day work-10 marks, record- 10 marks and the remaining 20 marks to be awarded by conducting an internal laboratory test. The end examination shall be conducted by the examiners, with a breakup mark of Procedure-10, Experimentation-25, Results-10, Viva- voce-15

8.5 There shall be a **Technical Seminar** during I year II semester for internal evaluation of100 marks. A student under the supervision of a faculty member shall collect the literature on a topic and critically review the literature and submit it to the department in a report form and shall make an oral presentation before the Project Review Committee consisting of Head of the Department, supervisor/mentor and two other faculty members of the department. The student must secure a minimum of 50% of marks, to be declared successful. If he fails to obtain the minimum marks, he must reappear for the same as and when supplementary examinations are conducted. The Technical seminar shall be conducted anytime during the semester as per the convenience of the Project Review Committee and students. There shall be no external examination for Technical Seminar.

8.6 There shall be Mandatory **Audit courses** in I & II semesters for zero credits. There is no external examination for audit courses. However, attendance shall be considered while calculating aggregate attendance and student shall be declared to have passed the mandatory course only when he/she secures 50% or more in the internal examinations. In case, the student fails, a re- examination shall be conducted for failed candidates for 40 marks every six months/semester satisfying the conditions mentioned in item 1 & 2 of the regulations.

8.7 A candidate shall be deemed to have secured the minimum academic requirement in a subject if he secures a minimum of 40% of marks in the End Examination and a minimum aggregate of 50% of the total marks in the End Semester Examination and Internal Evaluation taken together.

8.8 In case the candidate does not secure the minimum academic requirement in any of the subjects he/she has to reappear for the Semester Examination either supplementary or regular in that subject or repeat the course when next offered or do any other specified subject as may be required.

8.9 The laboratory records and mid semester test papers shall be preserved for a minimum of 3 years in the respective institutions as per the University norms.

9. Credit Transfer Policy

As per University Grants Commission (Credit Framework for Online Learning Courses through SWAYAM) Regulation, 2016, the University shall allow up to a maximum of 40% of the total courses being offered in a particular Programme in a semester through the Online Learning courses through SWAYAM.

9.1 The University shall offer credit mobility for MOOCs and give the equivalent

credit weightage to the students for the credits earned through online learning courses through SWAYAM platform.

9.2 The online learning courses available on the SWAYAM platform will be considered for credit transfer. SWAYAM course credits are as specified in the platform

9.3 Student registration for the MOOCs shall be only through the institution, it is mandatory for the student to share necessary information with the institution

9.4 The institution shall select the courses to be permitted for credit transfer through SWAYAM. However, while selecting courses in the online platform institution would essentially avoid the courses offered through the curriculum in the offline mode.

9.5 The institution shall notify at the beginning of semester the list of the online learning courses eligible for credit transfer in the forthcoming Semester.

9.6 The institution shall also ensure that the student has to complete the course and produce the course completion certificate as per the academic schedule given for the regular courses in that semester

9.7 The institution shall designate a faculty member as a Mentor for each course to guide the students from registration till completion of the credit course.

9.8 The university shall ensure no overlap of SWAYAM MOOC exams with that of the university examination schedule. In case of delay in SWAYAM results, the university will re-issue the marks sheet for such students.

9.9 Student pursuing courses under MOOCs shall acquire the required credits only after successful completion of the course and submitting a certificate issued by the competent authority along with the percentage of marks and grades.

9.10 The institution shall submit the following to the examination section of the university:

a) List of students who have passed MOOC courses in the current semester along with the certificates of completion.

b) Undertaking form filled by the students for credit transfer.

9.11 The university shall resolve any issues that may arise in the implementation of this policy from time to time and shall review its credit transfer policy in the light of periodic changes brought by UGC, SWAYAM, NPTEL and state government.

Note: Students shall also be permitted to register for MOOCs offered through online platforms other than SWAYAM NPTEL. In such cases, credit transfer shall be permitted only after seeking approval.

10. Re-registration for Improvement of Internal Evaluation Marks:

A candidate shall be given one chance to re-register for each subject provided the internal marks secured by a candidate are less than 50% and has failed in the end examination

10.1 The candidate should have completed the course work and obtained examinations results for I, II and III semesters.

10.2 The candidate should have passed all the subjects for which the Internal Evaluation marks secured are more than 50%.

10.3 Out of the subjects the candidate has failed in the examination due to Internal Evaluation marks secured being less than 50%, the candidate shall be given one chance for each Theory subject and for a maximum of <u>three</u> Theory subjects for Improvement of Internal evaluation marks.

10.4 The candidate has to re-register for the chosen subjects and fulfil the academic requirements.

10.5 For re registration the candidates have to apply to the University through the college by paying the requisite fees and get approval from the University before the start of the semester in which re-registration is required

10.6 In the event of availing the Improvement of Internal evaluation marks, the internal evaluation marks as well as the End Examinations marks secured in the previous attempt(s) for the reregistered subjects stand cancelled.

11. Evaluation of Project/Dissertation Work:

The Project work shall be initiated at the beginning of the III Semester and the duration of the Project is of two semesters. Evaluation of Project work is for 300 marks with 200 marks for internal evaluation and 100 marks for external evaluation. Internal evaluation of the Project Work – I & Project work – II in III & IV semesters respectively shall be for 100 marks each. External evaluation of final Project work viva voce in IV semester shall be for 100 marks.

A Project Review Committee (PRC) shall be constituted with the Head of the Department as Chairperson, Project Supervisor and one faculty member of the department offering the M.Tech. programme.

11.1 A candidate is permitted to register for the Project Work in III Semester after satisfying the attendance requirement in all the subjects, both theory and laboratory (in I & II semesters).

11.2 AcandidateispermittedtosubmitProjectdissertationwiththeapprovalof PRC. The candidate has to pass all the theory, practical and other courses before submission of the Thesis.

11.4 Project work shall be carried out under the supervision of teacher in the parent department concerned.

11.5 A candidate shall be permitted to work on the project in an industry/research organization on the recommendation of the Head of the Department. In such cases, one of the teachers from the department concerned would be the internal guide and an expert from the industry/ research organization concerned shall act as co-supervisor/ external guide. It is mandatory for the candidate to make full disclosure of all data/results on which they wish to base their dissertation. They cannot claim confidentiality simply because it would come into conflict with the Industry's or R&D laboratory's own interests. A certificate from the external supervisor is to be included in the dissertation.

11.6 Continuous assessment of Project Work - I and Project Work – II in III & IV semesters respectively will be monitored by the PRC.

11.7 The candidate shall submit status report by giving seminars in three different phases (two in III semester and one in IV semester) during the project work period. These seminar reports must be approved by the PRC before submission of the Project Thesis.

11.8 After registration, a candidate must present in Project Work Review - I, in consultation with his Project Supervisor, the title, objective and plan of action of his Project work to the PRC for approval within four weeks from the commencement of III Semester. Only after obtaining the approval of the PRC can the student initiate the project work.

11.9 The Project Work Review - II in III semester carries internal marks of 100. Evaluation should be done by the PRC for 50 marks and the Supervisor will evaluate the work for the other 50 marks. The Supervisor and PRC will examine

the Problem Definition, Objectives, Scope of Work, Literature Survey in the same domain and progress of the Project Work.

11.10 A candidate has to secure a minimum of 50% of marks to be declared successful in Project Work Review - II. Only after successful completion of Project Work Review – II, candidate shall be permitted for Project Work Review – III in IV Semester. The unsuccessful students in Project Work Review - II shall reappear for it as and when supplementary examinations are conducted.

11.11 The Project Work Review - III in IV semester carries 100 internal marks. Evaluation should be done by the PRC for 50 marks and the Supervisor will evaluate it for the other 50 marks. The PRC will examine the overall progress of the Project Work and decide whether or not eligible for final submission. A candidate has to secure a minimum of 50% of marks to be declared successful in Project Work Review - III. If he fails to obtain the required minimum marks, he has to reappear for Project Work Review - III after a month.

11.12 For the approval of PRC the candidate shall submit the draft copy of dissertation to the Head of the Department and make an oral presentation before the PRC.

11.13 After approval from the PRC, the students are required to submit a report showing that the plagiarism is within 30%. The dissertation report will be accepted only when the plagiarism is within 30%, which shall be submitted along with the dissertation report.

11.14 Research paper related to the Project Work shall be published in conference proceedings/UGC recognized journal. A copy of the published research paper shall be attached to the dissertation.

11.15 After successful plagiarism check and publication of research paper, three copies of the dissertation certified by the supervisor and HOD shall be submitted to the College.

11.16 The dissertation shall be adjudicated by an external examiner selected by the University. For this, the Principal of the College shall submit a panel of three examiners as submitted by the supervisor concerned and department head for each student. However, the dissertation will be adjudicated by one examiner nominated by the University.

11.17 If the report of the examiner is not satisfactory, the candidate shall revise and resubmit the dissertation, in the time frame as decided by the PRC. If report of the examiner is unfavorable again, the thesis shall be summarily rejected. The candidatehastoreregisterfortheprojectandcompletetheprojectwithinthe stipulated time after taking the approval from the University

11.18 If the report of the examiner is satisfactory, the Head of the Department shall coordinate and make arrangements for the conduct of Project Viva voce exam.

11.19 The Project Viva voce examinations shall be conducted by a board consisting of the Supervisor, Head of the Department and the external examiner who has adjudicated the dissertation. For Dissertation Evaluation (Viva voce) in IV Sem. there are external marks of 100 and it is evaluated by external examiner. The candidate must secure a minimum of 50% marks in Viva voce exam.

11.20 If he fails to fulfil the requirements as specified, he will reappear for the Project Viva voce examination only after three months. In the reappeared examination also, if he fails to fulfil the requirements, he will not be eligible for the award of the degree.

12. Credits for Co-curricular Activities

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The credits assigned for co-curricular activities shall be given by the principals of the colleges and the same shall be submitted to the University.
A Student shall earn 02 credits under the head of co-curricular activities, viz., attending Conference, Scientific Presentations and Other Scholarly Activities.
Following are the guidelines for awarding Credits for Co-curricular Activities

Name of the Activity	Maximum Credits/ Activity
Participation in National Level Seminar/ Conference/ Workshop /Training programs (related to the specialization of the student)	1
Participation in International Level Seminar / Conference / workshop/Training programs held outside India (related to the Specialization of the student)	2
Academic Award/ Research Award from State Level/National Agencies	1
Academic Award/Research Award from International Agencies	2
Research/Review Publication in National Journals (Indexed in Scopus / Web of Science)	1
Research/Review Publication in International Journals with Editorial board outside India (Indexed in Scopus / Web of Science)	2

Note:

i) Credit shall be awarded only for the first author. Certificate of attendance and participation in a Conference/Seminar is to be submitted for awarding credit.
ii) Certificate of attendance and participation in workshops and training programs (Internal or External) is to be submitted for awarding credit. The total duration should be at least one week.
iii) Participation in any activity shall be permitted only once for acquiring required credits under co curricular activities

13. Grading:

As a measure of the student's performance, a 10-point Absolute Grading System using the following Letter Grades and corresponding percentage of marks shall be followed:
After each course is evaluated for 100 marks, the marks obtained in each course will be converted to a corresponding letter grade as given below, depending on the range in which the marks obtained by the student fall.

Structure of Grading of Academic Performance

Range in which the marks In the subject fall	Grade	Grade points Assigned
≥90	S (Superior)	10
≥80 &<90	A(Excellent)	9
≥70&<80	B(Very Good)	8
≥60 &<70	C(Good)	7
≥50&<60	D(Pass)	6
<50	F (Fail)	0
Absent	Ab (Absent)	0

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A student obtaining Grade 'F' or Grade 'Ab' in a subject shall be considered failed and will be required to reappear for that subject when it is offered in the next supplementary examination.

i) For non credit audit courses, "Satisfactory" or "Unsatisfactory" shall be indicated instead of the letter grade and this will not be counted for the computation of SGPA/CGPA/Percentage.

Computation of Semester Grade Point Average (SGPA) and Cumulative Grade Point Average (CGPA):

The Semester Grade Point Average (SGPA) is the ratio of sum of the product of the number of credits with the grade points scored by a student in all the courses taken by a student and the sum of the number of credits of all the courses undergone by a student, i.e.,

$$SGPA=\Sigma (C_i \times G_i)/\Sigma C_i$$

where, C_i isthe number of credits of the i^{th} subject and G_i is the grade point scored by the student in the i^{th} course.

i) The Cumulative Grade Point Average (CGPA) will be computed in the same manner considering all the courses undergone by a student over all the semesters of a program, i.e.,

$$CGPA=\Sigma(C_i \times S_i)/ \Sigma C_i$$

where "S_i"is the SGPA of the i^{th} semester and C_i is the total number of credits of i^{th} semester.

ii) Both SGPA and CGPA shall be rounded off to 2 decimal points and reported in the transcripts.

iii) While computing the SGPA the subjects in which the student is awarded Zero grade points will also be included.

Grade Point: It is a numerical weight allotted to each letter grade on a 10-point scale. Letter Grade : It is an index of the performance of students in a said course. Grades are denoted by letters S, A, B, C, D and F.

14. Award of Class:

After a student has satisfied the requirements prescribed for the completion of the program and is eligible for the award of M. Tech. Degree, he shall be placed in one of the following three classes:

Class Awarded	Percentage of Marks to be secured
First Class with Distinction	≥70%
First Class	<70%≥ 60%
Pass Class	<60%≥ 50%

15. Exit Policy: The student shall be permitted to exit with a PG Diploma based on his/her request to the university through the institution at the end of first year subject to passing all the courses in first year.

The University shall resolve any issues that may arise in the implementation of this policy from time to time and shall review the policy in the light of periodic changes brought by UGC, AICTE and State government.

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16. Withholding of Results:

If the candidate has any case of in-discipline pending against him, the result of the candidate shall be withheld, and he will not be allowed/promoted into the next higher semester. The issue of degree is liable to be withheld in such cases.

17. Transitory Regulations

Discontinued, detained, or failed candidates are eligible for readmission as and when the semester is offered after fulfilment of academic regulations. Candidates who have been detained for want of attendance or not fulfilled academic requirements or who have failed after having undergone the course in earlier regulations or have discontinued and wish to continue the course are eligible for admission into the unfinished semester from the date of commencement of class work with the same or equivalent subjects as and when subjects are offered, subject to Section2 and they will follow the academic regulations into which they are readmitted.

18. General:

18.1 The academic regulations should be read for purpose of any interpretation.

18.2 Disciplinary action for Malpractice/improper conduct in examinations is appended.

18.3 Where the words “he”, “him”, “his”, occur in the regulations, they include “she”, “her”, “hers”.

18.4 In the case of any doubt or ambiguity in the interpretation of the above rules, the decision of the Vice-Chancellor is final.

18.5 The University may change or amend the academic regulations or syllabi at any time and the changes or amendments shall be made applicable to all the students on rolls with effect from the dates notified by the University.

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RULES FOR DISCIPLINARY ACTION FOR MALPRACTICES / IMPROPER CONDUCT IN EXAMINATIONS

	Nature of Malpractices /Improper conduct	Punishment
	If the candidate:	
1.(a)	Possesses or keeps accessible in examination hall, any paper, notebook, programmable calculators, cell phones pager, palm computers or any other form of material concerned with or related to the subject of the examination (theory or practical) in which he is appearing but has not made use of (material shall include any marks on the body of the candidate which can be used as an aid in the subject of the examination)	Expulsion from the examination hall and cancellation of the performance in that subject only.
(b)	Gives assistance or guidance or receives it from any other candidate orally or by any other body language methods or communicates through cell phones with any candidate or persons in or outside the exam hall in respect of any matter.	Expulsion from the examination hall and cancellation of the performance in that subject only of all the candidates' involved. In case of an outsider, he will be handed over to the police and a case is registered against him.
2.	Has copied in the examination hall from any paper, book, programmable calculators, palm computers or any other form of material relevant to the subject of the examination (theory or practical) in which the candidate is appearing.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted to appear for the remaining examinations of the subjects of that semester/year. The Hall Ticket of the candidate is to be cancelled and sent to the University.
3.	Impersonates any other candidate in connection with the examination.	The candidate who has impersonated shall be expelled from examination hall. The candidate is also debarred For four consecutive semesters from class work and all University examinations. The continuation of the Course by the candidate is subject to the Academic Regulations in connection with forfeiture of seat. The Performance of the original candidate who has been impersonated, shall be cancelled in all the subjects of the examination (including practical's and project work) already appeared and shall not be allowed to appear for examinations

		of the remaining subjects of that semester/year. The candidate is also debarred for four consecutive semesters from class work and all University examinations if his involvement is established. Otherwise, the candidate is debarred for two consecutive semesters from class work and all University examinations. The continuation of the Course by the candidate is subject to the academic Regulations in connection with forfeiture of seat. If the Imposter is an outsider, he will be handed over to the Police and a case is registered against him.
4.	Smuggles in the Answer book or additional sheet or takes out or arranges to send out the question paper during the examination or answer book or additional sheet, during or after the examination.	Expulsion from the examination hall and cancellation of performance in that subject and all the other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all University examinations. The continuation of the course by the candidate is subject to the academic regulations in connection With forfeiture of seat.
5.	Uses objectionable, abusive or offensive language in the answer paper or in letters to the examiners or writes to the examiner requesting him to award pass marks.	Cancellation of the performance in that subject only.
6.	Refuses to obey the orders of the Chief Superintendent /Assistant- Superintendent /any officer on duty or misbehaves or creates disturbance of any kind in and around the examination hall or organizes a walk out or instigates others to walk out, or threatens the officer-incharge or any person on duty in or outside the examination hall of any injury to his person or to any of his relations whether by words, either spoken or written or by signs or by visible representation, assaults the officer-in-charge, or any person on duty in or outside the examination hall or any of his relations, or indulges in any other act of misconduct or mischief which result in damage to or destruction	In case of students of the college, they shall be expelled from examination halls and cancellation of their performance in that subject and all other subjects the candidate(s) has (have) already appeared and shall not be permitted to appear for the remaining examinations of the subjects of that semester/year. If the candidate physically assaults the invigilator/officer-in-charge of the Examinations, then the candidate is also debarred and forfeits his/her seat. In case of outsiders, they will be handed over to the police and a police case is registered against them.

	of property in the examination hall or any part of the College campus or engages in any other act which in the opinion of the officer on duty amounts to use of unfair means or misconduct or has the tendency to disrupt the orderly conduct of the examination.	
7.	Leaves the exam hall taking away answer script or intentionally tears of the script or any part there of inside or outside the examination hall.	Expulsion from the examination hall and cancellation of performance in that subject and all the other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all University examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat.
8.	Possess any lethal weapon or firearm in the examination hall.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred and forfeits the seat.
9.	If student of the college, who is not a candidate for the particular examination or any person not connected with the college indulges in any malpractice or Improper conduct mentioned in clause 6 to 8.	Student of the colleges expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred and forfeits the seat. Person(s) who do not belong to the College will be handed over to police and a police case will be registered against them.
10.	Comes in a drunken condition to the examination hall.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall

		not be permitted for the remaining examinations of the subjects of that semester/year.
11.	Copying detected on the basis of internal evidence, such as, during valuation or during special scrutiny.	Cancellation of the performance in that subject only or in that subject and all other subjects the candidate has appeared including practical examinations and project work of that semester/year examinations, depending on the recommendation of the committee.
12.	If any malpractice is detected which is not covered in the above clauses 1 to 11 shall be reported to the University for further action to award suitable punishment.	

1. Malpractices identified by squad or special invigilators
2. Punishments to the candidates as per the above guidelines.
3. Punishment for institutions: (if the squad reports that the college is also involved in encouraging malpractices)
4. A show cause notice shall be issued to the college.
5. Impose a suitable fine on the college.
6. Shifting the examination center from the college to another college for a specific period of not less than one year.

Note:

Whenever the performance of a student is cancelled in any subject/subjects due to Malpractice, he has to register for End Examinations in that subject/subjects consequently and has to fulfil all the norms required for the award of Degree.

SKUCET Curriculum
M.Tech Course Structure – R25
STRUCTURAL ENGINEERING (STRC)

Semester-I					
STRUCTURAL ENGINEERING (STRC)					
S.No.	**Course Code**	**Course Name**	**Category**	**L- T - P**	**Credits**
1.		Advanced Structural Analysis	PC	3-0-0	3
2.		Advanced Concrete Technology	PC	3-0-0	3
3.		Program Elective Course - I 1. Advanced Mathematical Method 2. Theory and Analysis Of Plates 3. Theory of Elasticity	PE	3-0-0	3
4.		Program Elective Course – II 1. Experimental Stress Analysis 2. Maintenance and Rehabilitation of Structures 3. Design of Bridges	PE	3-0-0	3
5.		Advanced Concrete Laboratory – I	PC	0-0-4	2
6.		Computer Aided Design Laboratory – I	PC	0-0-4	2
7.		Research Methodology and IPR	MC	2-0-0	2
8.		Audit Course – I 1. English for Research Paper Writing 2. Value Education 3. Pedagogy Studies	AC	2-0-0	0
				Total	**18**

Sri Krishnadevaraya University College of Engineering & Technology					
STRUCTURAL ENGINEERING (STRC)					
Semester-II					
S.No.	**Course Code**	**Course Name**	**Category**	**L- T - P**	**Credits**
1.		Structural Dynamics	PC	3-0-0	3
2.		Finite Element Methods for Structural Engineering	PC	3-0-0	3
3.		Program Elective Course – III 1. Advanced Reinforced Concrete Design 2. Design of Prestressed Concrete 3. Analysis of Shells and Folded Plates	PE	3-0-0	3
4.		Program Elective Course – IV 1. Stability of Structures 2. Advanced Steel Design 3. Fracture Mechanics	PE	3-0-0	3
5.		Advanced Concrete Laboratory – II	PC	0-0-4	2
6.		Computer Aided Design Laboratory – II	PC	0-0-4	2
7.		Technical Seminar	PR	0-0-4	2
8.		Audit Course – II 1. Disaster Management 2. Constitution of India 3. Stress Management by Yoga	AC	2-0-0	0
				Total	**18**

Sri Krishnadevaraya University College of Engineering & Technology					
STRUCTURAL ENGINEERING (STRC)					
Semester-III					
S.No.	**Course Code**	**Course Name**	**Category**	**L- T - P**	**Credits**
1.		Program Elective Course – V 1. Earthquake Resistant Design of Buildings 2. Cost Effective Housing Techniques 3. Building Construction Management	PE	3-0-0	3
2.		Open Elective 1. Green Buildings 2. Retrofitting of Structures 3. Operation Research	OE	3-0-0	3
3.		Dissertation Phase – I	PR	0-0-20	10
4		Co-Curricular Activities	PR		02
				Total	**18**

Sri Krishnadevaraya University College of Engineering & Technology					
STRUCTURAL ENGINEERING (STRC)					
Semester-IV					
S.No.	**Course Code**	**Course Name**	**Category**	**L- T - P**	**Credits**
1.		Dissertation Phase – II	PR	0-0-32	16
				Total	**16**

Course Code	ADVANCED STRUCTURAL ANALYSIS	L	T	P	C
		3	0	0	3
Semester		I			

Course Objectives:

1.To understand the static and kinematic indeterminacy of the structures
2.To understand the concepts of matrix methods of analysis of structures
3.To understand the analysis of continuous beams.
4.To understand the analysis of rigid and pin jointed frames

Course Outcomes (CO):

On successful completion of the course, the students will able to:
1. Distinguish determinate and indeterminate structures.
2. Identify the method of analysis for indeterminate structures.
3. Apply matrix methods of analysis for continuous beams.
4. Apply matrix methods of analysis for rigid and pin jointed frames.

UNIT - I **INTRODUCTION:**

Indeterminacy-Determination of static and kinematic indeterminacies of two-dimensional and three-dimensional portal frames, pin jointed trusses and hybrid frames-coordinate systems – structural idealization. Introduction To Matrix Methods Of Analysis-Flexibility and stiffness matrices-Force displacement relationships for axial force, couple, torsional moments – stiffness method of analysis and flexibility method of analysis.

UNIT - II **ANALYSIS OF CONTINUOUS BEAMS**

Stiffness method and flexibility method of analysis –continuous beams of two and three spans with different end conditions internal hinges.

UNIT - III **ANALYSIS OF TWO DIMENSIONAL PORTAL FRAMES & PINJOINTED TRUSSES**

Stiffness and flexibility method of analysis of 2D portal frames with different end conditions-plotting of bending moment diagrams. Computation of joint displacement and member forces for pin jointed trusses.

UNIT - IV **TRANSFORMATION OF CO-ORDINATES**

Local and Global co-ordinate systems-transformation of matrices from local to global coordinates of element stiffness matrix-direct stiffness method of analysis-assembly of global stiffness matrix from element stiffness matrices –static condensation-sub-structuring.

UNIT - V **EQUATION SOLVERS**

Solution of system of linear algebraic equations-direct inversion method-gauss elimination method-Cholesky method-banded equation solvers-frontal solution technique.

Text Books:

1. Matrix Analysis of Frames structures by William Weaver J.R and James M.Gere, CBS publications.
2. Advanced Structural Analysis by Ashok.K.Jain, New Channel Brothers.
3. Matrix method of Structural Analysis by Pandit & Gupta

Reference Books:

1. Matrix Structural Analysis by Madhu B. Kanchi.
2. Matrix Methods of Structural Analysis by J.Meek.
3. Structural Analysis by Ghali and Neyveli.
4. Structural Analysis by Devdas Menon, Narosa Publishing Housing Pvt Ltd.

Course Code	ADVANCED CONCRETE TECHNOLOGY	L	T	P	C
		3	0	0	3
Semester		I			

Course Objectives:

1. The objective of the course is to provide students to obtain an in-depth knowledge of a wide variety of advanced topics in concrete technology and practice.
2. Concrete, being the popular materials for the construction material for civil infrastructure building, is undergoing significant changes in the recent times, in relation to the constituent materials used, production technology, testing methods and performance requirements.

Course Outcomes (CO):

On successful completion of the course, the students will able to:

1. On complete of this course the students will able to understand the construction material, meeting the demanding performance requirements based on men, machines and materials.
2. Innovative special concrete with mixes, applications and limitations.
3. Testing methods developed to increase the scope of concrete usage as an advanced material

UNIT - I	Fibre Reinforced Concrete & Ferro Cement

Fibre reinforced concrete: History, mechanism, different types of fibres, Aspect ratio, Volume of fibres, orientation of fibres, balling effect, properties of fibre reinforced concrete, applications of fibre reinforced concrete. Types of Fibre reinforced concrete.

Ferro cement: Definition, different materials used, casting techniques, properties of Ferro cement, applications.

UNIT - II	Light Weight Concrete and High Density Concrete

Light Weight Concrete: Introduction, classification, properties, strength and durability, mix proportioning and problems.

High Density Concrete: Radiation shielding ability of concrete, materials for high density concrete, mix proportioning, properties in fresh and hardened state, placement methods.

UNIT - III	Ready mix concrete:

Ready mix concrete: Concept, ready mix concrete plants, difficulties faced and their solution, use of admixtures in ready mix concrete, economics and quality control aspects of ready mix concrete. High Performance Concrete: Constituents, mix proportioning, properties in fresh and hardened states, applications & limitations.

UNIT - IV	Polymer Concrete:

Polymer concrete: Polymers, resins, polymerization, different types of polymer concrete like polymer impregnated concrete, polymer concrete (Resin concrete) and polymer modified concrete, their properties and applications. Self-compacting concrete: Development of SCC, basic principles and requirements, workability tests for SCC, mix design of SCC, acceptance criteria for SCC, adoption of SCC in the precast industry, present status of SCC

UNIT - V	Mix Design & Concrete from Industrial wastes

MIX DESIGN: ACI method of mix design and British DoE method of mix design of mix design, Acceptance criteria for compressive strength and flexural strength.

a. Blast furnace slag cement concrete b. Fly-ash concrete c. Silica fume concrete d.Recycled aggregate Concrete

Text Books:

1. Properties of Concrete by A.M.Neville – Pearson Publication – 4th Edition
2. Concrete Technology by M.S.Shetty. – S.Chand & Co. ; 2004
3. Concrete Technology by A.R. Santhakumar, Oxford University Press, New Delhi

Reference Books:

1. Concrete: Micro Structure, Properties and Materials – P.K.Mehta and J.M.Monteiro, Mc-Graw Hill Publishers
2. Design of Concrete Mix by Krishna Raju, CBS Pubilishers.
3. Concrete Technology by A.M.Neville – Pearson Publication
4. Concrete Technology by M.L. Gambhir. – Tata Mc. Graw Hill Publishers, New Delhi
5. Non-Destructive Test and Evaluation of Materials by J.Prasad & C.G.K. Nair , Tata Mcgraw Hill Publishers, New Delhi.

Course Code	ADVANCED MATHEMATICAL METHOD (PE-I)	L	T	P	C
		3	0	0	3
Semester		I			

Course Objectives:

1. To familiarize the student to different mathematical techniques
2. To familiarize the finite methods and its applications

Course Outcomes (CO):

On successful completion of the course, the students will able to:

1. Understand the concepts of maxima and minima with different principles
2. Solve different complex differential equations with numerical methods
3. Solve different partial differential equations with numerical methods
4. Understand the finite element methods

UNIT - I

Calculus of variation-Concepts of maxima and minima of functions-constraints and Lagrange's multipliers-Extreme value of functional-Euler's equations – solutions of Euler's equation. Hamilton principal- Lagrange equations generalized dynamic excitations – constraints in dynamical systems

UNIT - II

Numerical solution of ordinary differential equations Taylor series method, Picard's method, Euler's method modified Euler's method & R.K.method. Eigen values and Eigen vectors – general method – Power method, spectral method

UNIT - III

Numerical solution of partial differential equations –Elliptical equations standard five points formula, diagonal five-point formula –solution of Laplace equation by Leibmann's iteration method, Poisson's equation and its applications

UNIT - IV

Numerical solution of partial differential equations – Parabolic equations bender –Schmidt method-bender - Schmidt recurrence equation, crank-Nicholson difference method

UNIT - V

Finite element method – weighted Residual methods, least square method, Galerkin's method – finite elements – Interpolating over the whole domain – Finite element application to boundary value problems

Text Books:

1. Numerical methods for Engineers by Steven C.Chapra and Raymond P.Canale – Mc Graw Hill Book Company.
2. Applied numerical analysis by Curtis. F.Gerald- Addeson Wesely Publishing Company.
3. Higher Engineering mathematics by B.S. Grewal Khanna Publishers.
4. C-Language and numerical methods by C-Xavier. New Age International publishers.
5. An Introduction to the finite element method, J.N.Reddy, McGraw. Hill, Inc

Reference Books:

1. Computational methods for partial differential equations by M.K.Jain, S.R.K.Iyengar, R.K.Jain.

Course Code	THEORY AND ANALYSIS OF PLATES (PE-I)	L	T	P	C
		3	0	0	3
Semester		I			

Course Objectives:

1.To know the behaviour of plates for external loads.
2.To know the behaviour of circular plates for external loads.
3.To know the behaviour of plates for simultaneous bending and stretching.
4.To know the behaviour of orthotropic plates.
5.To know the numerical and approximate methods for the analysis of plates.

Course Outcomes (CO):

On successful completion of the course, the students will able to:
1.Analyse the plates for external loads.
2.Analyse the circular plates for external loads.
3.Analyse the plates for simultaneous bending and stretching.
4.Analyse the orthotropic plates.
5.Analyse the plates by numerical methods.

UNIT - I **DERIVATION OF PLATE EQUATIONS FOR RECTANGULAR PLATES**

In plane bending and transverse bending effects. Plates under various loading conditions like concentrated, U.D.L and hydrostatic pressure- Navier and Levy's type of solutions for various boundary conditions.

UNIT - II **CIRCULAR PLATES:**

Symmetrically loaded, circular plates under various loading conditions, annular plates.

UNIT - III **PLATES UNDER SIMULTANEOUS BENDING AND STRECTHING:**

Derivation of the governing equation and application to simple cases

UNIT - IV **ORTHOTROPIC PLATES:**

Derivation of the governing equation, applications to grillage problems as equivalent orthotropic plates.

UNIT - V **NUMERICAL AND APPROXIMATE METHODS:**

Energy solutions by variational methods, finite difference and finite element methods of analysis for plate problems. Study of few simple cases for large deflection theory of plates .

Text Books:

1. Theory of Plates & Shells –Stephen, P.Timoshenko, S.Woinowsky-Krieger – Tata MC Graw Hill Edition
2. Analysis and design of concrete shell roofs by G.S.Ramaswami. CBS publications.
3. Design of concrete shell roofs by Billington – Tata MC Graw Hill, New York

Reference Books:

1. Shell Analysis by N.K.Bairagi. Khanna Publishers, New Delhi.
2. Design of Shells and Folded Plates by P.C. Varghese, PHI Learning Pvt. Ltd
3. Design of concrete shell roofs by Chaterjee. Oxford and IBH.,

Course Code	THEORY OF ELASTICITY (PE-I)	L	T	P	C
		3	0	0	3
Semester		I			

Course Objectives:

1.To make students understand the principles of elasticity.
2.To familiarize students with basic equations of elasticity.
3.To expose students to two dimensional problems in Cartesian and polar coordinates.
4.To make students understand the principle of torsion of prismatic bars.

Course Outcomes (CO):

On successful completion of the course, the students will able to:
1. To apply elastic analysis to study the fracture mechanics.
2.To apply linear elasticity in the design and analysis of structures such as beams, plates, shells and sandwich composites.
3.To apply hyper elasticity to determine the response of elastomer-based objects.
4.To analyze the structural sections subjected to torsion.

UNIT - I **INTRODUCTION TO PLANE STRESS and PLANE STRAIN ANALYSIS:**

Elasticity –Notation for Forces and Stresses-Components of Stresses –Components of Strain –Hooke's Law. Plane Stress-Plane Strain-Differential Equations of Equilibrium- Boundary Conditions- Compatibility Equations-Stress Function-Boundary Conditions.

UNIT - II **TWO DIMENSIONAL PROBLEMS in RECTANGULAR COORDINATES:**

Solution by Polynomials-Saint Venant's Principle-Determination of Displacements-Bending of Simple Beams-Application of Fourier Series for Two Dimensional Problems - Gravity Loading.

UNIT - III **TWO DIMENSIONAL PROBLEMS in POLAR COORDINATES :**

General Equation in Polar Co-Ordinates - Stress Distribution Symmetrical About An Axis – Pure Bending of Curved Bars- Strain Components in Polar Coordinates-Displacements for Symmetrical Stress Distributions-Simple Symmetric and Asymmetric Problems-General Solution of Two Dimensional Problem in Polar Coordinates-Application of The General Solution of Two Dimensional Problem in Polar Coordinates-Application of The General Solution in Polar Coordinates.

UNIT - IV

ANALYSIS OF STRESS AND STRAIN IN THREE DIMENSIONS: Principle Stress - Ellipsoid and Stress-Director Surface-Determination of Principle Stresses- Maximum Shear Stresses-Homogeneous Deformation-Principle Axis of Strain Rotation.
General Theorems: Balance Laws - Differential Equations of Equilibrium- Conditions of Compatibility - Determination of Displacement-Equations of Equilibrium in Terms of Displacements-Principle of Superposition-Uniqueness of Solution –The Reciprocal Theorem.

UNIT - V **TORSION OF PRISMATIC BARS:**

Torsion of Prismatic Bars- Elliptical Cross Section-Other Elementary Solutions-Membrane Analogy-Torsion of Rectangular Bars-Solution of Torsional Problems by Energy Method-Use of Soap Films in Solving Torsional Problems-Hydra Dynamical Analogies-Torsion of Shafts, Tubes and Bars.

Text Books:
1. Theory of Elasticity and Plasticity by Timoshenko, S., MC Graw Hill Book company. 2. Advanced Strength of materials by Papoov, MC Graw Hill Book company. 3. Theory of Elasticity and Plasticity by Sadhu Singh. Khanna Publishers.
Reference Books:
1. Plasticity for structural Engineers- Chen, W.F. and Han, D.J., Springer – Verlag, New York. 2. Plasticity theory, Lubliner, J., Mc Millan Publishing Co., New York. 3. Foundations of Solid Mechanics by Y.C.Fung, PHI Publications. 4. Advanced Mechanics of Solids by L.S. Srinath, Tata MC Graw Hill Book company.

Course Code	EXPERIMENTAL STRESS ANALYSIS (PE-II)	L	T	P	C
		3	0	0	3
Semester		I			

Course Objectives:

1. To perform NDT test and interpret the results
2. To understand the science behind working of strain gauge
3. Understand the practical applications of strain gauge
4. To determine the stress distribution in an acrylic block using the concept of photo elasticity

Course Outcomes (CO):

On successful completion of the course, the students will able to:

1. To understand the mechanical properties of strain gauges and applications
2. To understand the design and performance of strain gauges
3. To understand the methods of Non destructive testing
4. To understand the methods of photo elasticity and models

UNIT - I **PRINCIPLES OF EXPERIMENTAL APPROACH**

Merits of Experimental Analysis Introduction, Uses of Experimental Stress Analysis Advantages of Experimental Stress Analysis, Different Methods –Simplification of Problems.

UNIT - II **STRAIN MEASUREMENT USING STRAIN GAUGES :**

Definition of Strain and Its Relation of Experimental Determinations Properties of Strain-Gauge Systems-Types of Strain Gauges –Mechanical, Acoustic and Optical Strain Gauges. Introduction To Electrical Strain Gauges - Inductance Strain Gauges – LVDT – Resistance Strain Gauges – Various Types –Gauge Factor – Materials of Adhesion Base.

UNIT - III **STRAIN ROSSETTES and NON – DESTRUCTIVE TESTING of CONCRETE:**

Introduction – The Three Elements Rectangular Rosette – The Delta Rosette Corrections for Transverse Strain Gauge. Ultrasonic Pulse Velocity Method –Application To Concrete. Hammer Test – Application To Concrete.

UNIT - IV **THEORY OF PHOTOELASTICITY** :

Introduction –Temporary Double Refraction – The Stress Optic Law –Effects of Stressed Model in A Polariscope for Various Arrangements – Fringe Sharpening. Brewster's Stress Optic Law.

UNIT - V **TWO DIMENSIONAL PHOTOELASTICITY :**

Introduction – Isochromatic Fringe Patterns- Isoclinic Fringe Patterns Passage of Light Through Plane Polariscope and Circular Polariscope Isoclinic Fringe Patterns – Compensation Techniques – Calibration Methods – Separation Methods – Scaling Model To Prototype Stresses – Materials for Photoelasticity- Properties of Photoelastic Materials.

Text Books:

1. Experimental Stress Analysis by J.W.Dally and W.F.Riley, College House Enterprises
2. Experimental Stress Analysis by Dr.Sadhu Singh.Khanna Publishers
3. Abdul Mubeen, "Experimental Stress Analysis", DhanpatRai and Sons, 2001.

Reference Books:

1. Experimental Stress Analysis by U.C.Jindal, Pearson Pubilications.
2. Experimental Stress Analysis by L.S.Srinath, MC.Graw Hill Company Publishers.
3. Moire Fringes in Strain Analysis, PS Theocaris, Pergammon Press, 2002.

Course Code	MAINTENANCE AND REHABILITATION OF STRUCTURES (PE-II)	L	T	P	C
		3	0	0	3
Semester		I			

Course Objectives:

1. To judge the rate of corrosion in various exposure conditions
2. To conduct non destructive testing of structural elements
3. To select suitable bonding technique
4. To judge the effect of fire and earthquake loads on discontinuities

Course Outcomes (CO):

On successful completion of the course, the students will able to:
1.Estimate the causes for distress and deterioration of structures
2.Apply the NDT for condition assessment of structures, identify damages in RC structures
3.Select repair material and retrofitting strategy suitable for distress
4.Formulate guidelines for repair management of deteriorated structures
5. Strengthening of earthquake and fire damaged elements using various techniques.

UNIT - I **INFLUENCE ON SERVICEABILITY AND DURABILITY:**

General: Quality Assurance for Concrete Construction, As Built Concrete Properties, Strength, Permeability, Volume Changes, Thermal Properties, Cracking. Effects Due To Climate, Temperature, Chemicals, Wear and Erosion, Design and Construction Errors, Corrosion Mechanism, Effects of Cover Thickness and Cracking Methods of Corrosion Protection, Inhibitors, Resistant Steels, Coatings Cathodic Protection.

UNIT - II **MAINTENANCE AND REPAIR STRATEGIES:**

Inspection, Structural Appraisal, Economic Appraisal, Components of Equality Assurance, Conceptual Bases for Quality Assurance Schemes.

UNIT - III **MATERIALS FOR REPAIR:**

Special Concretes and Mortar, Concrete Chemicals, Special Elements for Accelerated Strength Gain, Expansive Cement, Polymer Concrete, Sulphur Infiltrated Concrete, Ferro Cement, Fibre Reinforced Concrete.

UNIT - IV **TECHNIQUES FOR REPAIR:**

Rust Eliminators and Polymers Coating for Rebars During Repair, Foamed Concrete, Mortar and Dry Pack, Vacuum Concrete, Gunite and Shotcrete Epoxy Injection, Mortar Repair for Cracks, Shoring and Underpinning.

UNIT - V **CASE STUDIES:**

Repairs To Overcome Low Member Strength, Deflection, Cracking, Chemical Disruption, Weathering, Wear, Fire, Leakage, Marine Exposure.

Text Books:

1. Dension Campbell, Allen and Harold Roper, Concrete Structures, Materials, Maintenance and Repair, Longman Scientific and Technical, U.K. 1991.
2. RT.Allen and S.C. Edwards, Repair of Concrete Structures, Blakie and Sons, UK, 1987.
3. MS. Shetty, Concrete Technology – Theory and Practice, S.Chand and Company, New Delhi, 1992.

Reference Books:

1. Santhakumar, A.R.Training Course Notes on Damage Assessment and Repair in Low Cost Housing RHDC-NBO Anna University, Madras, July, 1992.
2. Raikar, R.N.Learning From Failures – Deficiencies in Design, Construction and Service

– R&D Centre (SDCPL), Raikar Bhavan, Bombay, 1987.
3. N.Palaniappan, Estate Management, Anna Institute of Management, Madras Sep. 1992.
4. F.K.Garas, J.L.Clarke, GST Armer, Structural Assessment, Butterworths, UK Aporil 1987.

Course Code	DESIGN OF BRIDGES (PE-II)	L	T	P	C
		3	0	0	3
Semester		I			

Course Objectives:

1. To understand the various types of bridges
2. To understand the codal provisions for loading and design standards of bridges
3. To design the superstructure of bridge using different methods and loading conditions
4. To understand the design of bearings

Course Outcomes (CO):

On successful completion of the course, the students will able to:

1. Finalize with the usage of codal provisions in the design of bridges
2. Analyze and design substructure elements of bridges
3. Analyze and design various types of bridges like t-beam bridge,slab bridge ,box culvert.
4. To analyze and design of T beam bridge

UNIT - I **INTRODUCTION**

Classification, Investigations and Planning, Choice of Type – Economic Span Length – IRC Specifications for Road Bridges, Standard Live Loads, Other Forces Acting on Bridges, General Design Considerations.

UNIT - II

Design of Box Culverts – General Aspects – Design Loads – Design Moments, Shears and Thrusts – Design of Critical Section.

Design of Slab Bridges – Effective Width of Analysis – Workings Stress Design and Detailing of Slab Bridges for IRC Loading.

UNIT - III **T-BEAM BRIDGES**

Introduction – Wheel Load Analysis – B.M. in Slab – Pigaud's Theory – Analysis of Longitudinal Girders by Courbon's Theory Working Stress Design and Detailing of Reinforced Concrete T-Beam Bridges for IRC Loading.

UNIT - IV **PRESTRESSED CONCRETE BRIDGES**

General Features – Advantages of Prestressed Concrete Bridges – Pre-tensioned Prestressed Concrete Bridges – Post Tensioned Prestressed Concrete Bridge Decks. Design of Post Tensioned Prestressed Concrete Slab Bridge Deck. Bridge Bearings – General Features – Types of Bearings – Forces on Bearings Basis for Selection of Bearings – Design Principles of Steel Rocker and Roller Bearings and Its Design – Design of Elastometric Pad Bearing Detailing of Elastomeric Pot Bearings.

UNIT - V **PIERS AND ABUTMENTS**

General Features – Bed Block – Materials for Piers and Abutments – Types of Piers – Forces Acting on Piers – Design of Pier – Stability Analysis of Piers – General Features of Abutments – Forces Acting on Abutments – Stability Analysis of Abutments.

Text Books:

1. Essentials of Bridges Engineering – D.Hohnson Victor Oxford & IBH Publishers Co-Private Ltd.
2. Design of Concrete Bridges MC Aswanin VN Vazrani, MM Ratwani, Khanna Publishers.
3. Bridge Engineering – S.Ponnuswamy. Tata Mc Graw Hill

Reference Books:

1. Concrete Bridge Design, Browe, R.E., C.R.Books Ltd., London, 1962.
2. Reinforced Concrete Bridges, Taylor F.W., Thomson, S.E., and Smulski E., John Wiley and Sons, New York, 1955.
3. An Introduction To Structural Design of Concrete Bridges, Derrick Beckett, Surrey University; Press, Henlely – Thomes, Oxford Shire, 1973
4. Bridge Analysis Simplified, Bakht.B.And Jaegar, L.G. Mc Graw Hill, 1985.
5. Design of Bridges – N.Krishna Raju – Oxford & IBH
6. Design of Bridge Structures – FR Jagadeesh, M.A. Jaya Ram – Eastern Economy Edition.

Course Code	ADVANCED CONCRETE LABORATORY – I	L	T	P	C
		3	0	0	3
Semester		I			

Course Objectives:

1.Mix design and Fresh Properties of Fly ash.
2. Compression Strength and Split Tensile Strength.
3. Mix design and Fresh Properties of GGBS.
4. Flexural Strength Properties of Metakaolin.

Course Outcomes (CO):

On successful completion of the course, the students will able to:
1.Mix design and Fresh Properties of Fly ash.
2. Compression Strength and Split Tensile Strength.
3. Mix design and Fresh Properties of GGBS.
4. Flexural Strength Properties of Metakaolin.

List of Experiments:

1. Mix design and Fresh Properties of Fly ash based M40 Grade Concrete.
2. Compression Strength and Split Tensile Strength Properties of Fly ash based M40 Grade Concrete.
3. Flexural Strength Properties of Fly ash based M40 Grade Concrete.
4. Mix design and Fresh Properties of GGBS based M40 Grade Concrete.
5. Compression Strength and Split Tensile Strength Properties of GGBS based M40 Grade Concrete.
6. Flexural Strength Properties of GGBS based M40 Grade Concrete.
7. Mix design and Fresh Properties of Silica Fume based M40 Grade Concrete.
8. Compression Strength and Split Tensile Strength Properties of Silica Fume based M40 Grade Concrete.
9. Flexural Strength Properties of Silica Fume based M40 Grade Concrete.
10. Mix design and Fresh Properties of Metakaolin based M40 Grade Concrete.
11. Compression Strength and Split Tensile Strength Properties of Metakaolin based M40 Grade Concrete.
12. Flexural Strength Properties of Metakaolin based M40 Grade Concrete.

Course Code	COMPUTER AIDED DESIGN LABORATORY – I	L	T	P	C
		3	0	0	3
Semester		I			

Course Objectives:

1. Demonstrate the design of reinforced concrete structural elements.
2. Explain earthquake resistant design
3. Explain analysis of a building for wind loading.
4. Demonstrate the method of analysis of truss.

Course Outcomes (CO):

On successful completion of the course, the students will able to:

1. Analyze and design the structural components like beams, slabs and columns,
2. Analyze and design retaining wall and shear wall.
3. Analyze for earthquake loading & wind loading of framed buildings.
4. Analyze and design pin jointed, rigid jointed plane structures.

List of Experiments:

1. Design of Singly reinforced concrete beam
2. Design of Doubly reinforced concrete beam
3. Design of reinforced concrete column subjected to biaxial bending
4. Design of One Way reinforced concrete slab
5. Design of Two Way reinforced concrete slab
6. Design of reinforced concrete retaining wall (cantilever type)
7. Design of reinforced concrete shear wall
8. Lateral forces on a building due to an earthquake using equivalent static method
9. Lateral forces on a building due to wind
10. Analysis of rigid jointed plane frames
11. Analysis of simply supported/cantilever beam
12. Analysis of plane truss and Design of Steel Tension Members.

References:

1. Staad Pro V8i for Beginners, T.S Sarma,Notion Press; (2014).
2. Learning Bentley Staad.Pro V8i for Structural Analysis, Sham Tickoo Dreamtech press (2015).
3. Technical Reference Manual for STAAD, Bentley

Course Code	RESEARCH METHODOLOGY AND IPR	L	T	P	C
		2	0	0	2
Semester		I			

Course Objectives:

1. Identify an appropriate research problem in their interesting domain.
2. Understand ethical issues
3. Understand the Preparation of a research project thesis report.
4. Understand the law of patent and copyrights.
5. Understand the Adequate knowledge on IPR

Course Outcomes (CO):

On successful completion of the course, the students will able to:

1. Understand research problem formulation.
2. Analyze research related information. Follow research ethics
3. Understand that today's world is controlled by Computer, Information Technology, but tomorrow world will be ruled by ideas, concept, and creativity.
4. Understanding that when IPR would take such important place in growth of individuals & nation, it is needless to emphasis the need of information about Intellectual Property Right to be promoted among students in general & engineering in particular.
5. Understand that IPR protection provides an incentive to inventors for further research work and investment in R & D, which leads to creation of new and better products, and in turn brings about, economic growth and social benefits.

UNIT - I

Meaning of research problem, Sources of research problem, Criteria Characteristics of a good research problem, Errors in selecting a research problem, scope, and objectives of research problem. Approaches of investigation of solutions for research problem, data collection, analysis, interpretation, Necessary instrumentations.

UNIT - II

Effective literature studies approaches, analysis Plagiarism, Research ethics, Effective technical writing, how to write report, Paper Developing a Research Proposal, Format of research proposal, a presentation and assessment by a review committee.

UNIT - III

Nature of Intellectual Property: Patents, Designs, Trade and Copyright. Process of Patenting and Development: technological research, innovation, patenting, development. International Scenario: International cooperation on Intellectual Property. Procedure for grants of patents, Patenting under PCT.

UNIT - IV

Patent Rights: Scope of Patent Rights. Licensing and transfer of technology. Patent information and databases. Geographical Indications.

UNIT - V

New Developments in IPR: Administration of Patent System. New developments in IPR; IPR of Biological Systems, Computer Software etc. Traditional knowledge Case Studies, IPR and IITs.

Text Books:

1. Stuart Melville and Wayne Goddard, "Research methodology: An introduction for science & engineering students'"
2. Wayne Goddard and Stuart Melville, "Research Methodology: An Introduction"

Reference Books:

1. Ranjit Kumar, 2nd Edition, "Research Methodology: A Step by Step Guide• for beginners"
2. Halbert, "Resisting Intellectual Property", Taylor & Francis Ltd ,2007.
3. Mayall, "Industrial Design", McGraw Hill, 1992.
4. Niebel, "Product Design", McGraw Hill, 1974.

Course Code	ENGLISH FOR RESEARCH PAPER WRITING	L	T	P	C
		2	0	0	0
Semester		I			

Course Objectives:

1. Understand the essentials of writing skills and their level of readability
2. Learn about what to write in each section
3. Ensure qualitative presentation with linguistic accuracy

Course Outcomes (CO):

On successful completion of the course, the students will able to:
1. Understand that how to improve your writing skills and level of readability
2. Learn about what to write in each section
3. Understand the skills needed when writing a Title Ensure the good quality of paper at very first-time submission

UNIT - I

Planning and Preparation, Word Order, Breaking up long sentences, Structuring Paragraphs and Sentences, Being Concise and Removing Redundancy, Avoiding Ambiguity and Vagueness

UNIT - II

Clarifying Who Did What, Highlighting Your Findings, Hedging and Criticising, Paraphrasing and Plagiarism, Sections of a Paper, Abstracts. Introduction

UNIT - III

Review of the Literature, Methods, Results, Discussion, Conclusions, The Final Check

UNIT - IV

key skills are needed when writing a Title, key skills are needed when writing an Abstract, key skills are needed when writing an Introduction, skills needed when writing a Review of the Literature

UNIT - V

Skills are needed when writing the Methods, skills needed when writing the Results, skills are needed when writing the Discussion, skills are needed when writing the Conclusions. useful phrases, how to ensure paper is as good as it could possibly be the first- time submission

Suggested Readings:

1. Goldbort R (2006) Writing for Science, Yale University Press (available on Google Books)
2. Day R (2006) How to Write and Publish a Scientific Paper, Cambridge University Press
3. Highman N (1998), Handbook of Writing for the Mathematical Sciences, SIAM. Highman'sbook .
4. Adrian Wallwork , English for Writing Research Papers, Springer New York Dordrecht Heidelberg London, 2011

Course Code	VALUE EDUCATION	L	T	P	C
		2	0	0	0
Semester		I			

Course Objectives:

Course Outcomes (CO):

On successful completion of the course, the students will able to:
1. Understand value of education and self- development
2. Imbibe good values in students
3. Let the should know about the importance of character

UNIT - I

Values and self-development –Social values and individual attitudes, Work ethics, Indian vision of humanism. Moral and non- moral valuation. Standards and principles.,Value judgements

UNIT - II

Importance of cultivation of values., Sense of duty. Devotion, Self-reliance. Confidence, Concentration, Truthfulness, Cleanliness. Honesty, Humanity. Power of faith, National Unity, Patriotism. Love for nature ,Discipline

UNIT - III

Personality and Behavior Development - Soul and Scientific attitude, Positive Thinking. Integrity and discipline. Punctuality, Love and Kindness. Avoid fault Thinking. Free from anger, Dignity of labour., Universal brotherhood and religious tolerance.

UNIT - IV

True friendship, Happiness Vs suffering, love for truth. Aware of self-destructive habits. Association and Cooperation. Doing best for saving nature

UNIT - V

Character and Competence –Holy books vs Blind faith. Self-management and Good health. Science of reincarnation. Equality, Nonviolence, Humility, Role of Women. All religions and same message. Mind your Mind, Self-control. Honesty, Studying effectively

Text Books:

1 Chakroborty, S.K. “Values and Ethics for organizations Theory and practice”, Oxford University Press, New Delhi

Reference Books:

Course Code	PEDAGOGY STUDIES	L	T	P	C
		2	0	0	0
Semester		I			

Course Objectives:

1. Review existing evidence on the review topic to inform programme design and policy making undertaken by the DfID, other agencies and researchers.
2. Identify critical evidence gaps to guide the development

Course Outcomes (CO):

On successful completion of the course, the students will able to:

1. Understand Pedagogical practices are being used by teachers in formal and informal class rooms in developing countries
2. Understand the effectiveness of these pedagogical practices
3. Design the curriculum and guidance materials to support effective pedagogy

UNIT - I

Introduction and Methodology, Aims and rationale, Policy background, Conceptual framework and terminology Theories of learning, Curriculum, Teacher education. Conceptual framework, Research questions, Overview of methodology and Searching.

UNIT - II

Thematic overview: Pedagogical practices are being used by teachers in formal and informal classrooms in developing countries. Curriculum, Teacher education.

UNIT - III

Evidence on the effectiveness of pedagogical practices, Methodology for the in depth stage: quality assessment of included studies. How can teacher education (curriculum and practicum) and the school, curriculum and guidance materials best support effective pedagogy? Theory of change. Strength and nature of the body of evidence for effective pedagogical, practices. Pedagogic theory and pedagogical approaches. Teachers' attitudes and beliefs and Pedagogic strategies

UNIT - IV

Professional development: alignment with classroom practices and followup support Peer support Support from the head teacher and the community. Curriculum and assessment Barriers to learning: limited resources and large class sizes

UNIT - V

Research gaps and future directions Research design Contexts Pedagogy Teacher education Curriculum and assessment Dissemination and research impact.

Suggested Readings:

1. Ackers J, Hardman F (2001) Classroom interaction in Kenyan primary schools, Compare, 31 (2): 245-261.
2. Agrawal M (2004) Curricular reform in schools: The importance of evaluation, Journal of Curriculum Studies, 36 (3): 361-379.
3. Akyeampong K (2003) Teacher training in Ghana - does it count? Multi-site teacher education research project (MUSTER) country report 1. London: DFID.
4. Akyeampong K, Lussier K, Pryor J, Westbrook J (2013) Improving teaching and learning of basic maths and reading in Africa: Does teacher preparation count? International Journal Educational Development, 33 (3): 272–282.
5. Alexander RJ (2001) Culture and pedagogy: International comparisons in primary education. Oxford and Boston: Blackwell.

6. Chavan M (2003) Read India: A mass scale, rapid, 'learning to read' campaign.
7. www.pratham.org/images/resource%20working%20paper%202.pdf.

Course Code	STRUCTURAL DYNAMICS	L	T	P	C
		3	0	0	3
Semester		II			

Course Objectives:

1. Determine vibration characteristics of structures like frequency, amplitude, impedance and time period
2. Differentiate the response of single and multi degree of freedom systems
3. Determine the response of structures for pulse excitation like blast load
4. Differentiate the response of Multi Degree of Freedom systems

Course Outcomes (CO):

On successful completion of the course, the students will able to:

1. Write equation of motion for single and multi degree of freedom systems
2. Understand the impact of damping on charecterstics of vibrating system
3. Gain Knowledge about arbitary and pulse excitation
4. Understand applications of Numerical methods in dynamics
5. Analyse in various theories of failure and plasticity

UNIT - I **THEORY OF VIBRATIONS:**

Introduction –Elements of A Vibratory System – Degrees of Freedom-Continuous Systems – Lumped Mass Idealization –Oscillatory Motion –Simple Harmonic Motion –Pictorial Representation of S.H.M - Free Vibrations of Single Degree of Freedom (SDOF) Systems – Undamped and Damped –Critical Damping –Logarithmic Decrement –Forced Vibrations of SDOF Systems-Harmonic Excitation –Dynamic Magnification Factor- Bandwidth. Fundamental Objective of Dynamic Analysis-Types of Prescribed Loading- Methods of Discretization- Formulation of The Equations of Motion.

UNIT - II **SINGLE DEGREE OF FREEDOM SYSTEM**

Formulation and Solutions of The Equation of Motion - Free Vibration Response –Response To Harmonic, Periodic, Impulsive and General Dynamic Loading –Duhamel Integral

UNIT - III **MULTI DEGREE OF FREEDOM SYSTEM**

Selection of The Degree of Freedom –Evaluation of Structural Property Matrices-Formulation of The MDOF Equations of Motion –Undamped Free Vibrations-Solution of Eigen Value Problem for Natural Frequencies and Mode Shapes- Analysis of Dynamic Response –Normal Coordinates –Uncoupled Equations of Motion –Orthogonal Properties of Normal Modes-Mode Superposition Procedure

UNIT - IV **PRACTICAL VIBRATION ANALYSIS**

Stodola Method- Fundamental Mode Analysis –Analysis of Second and Higher Modes – Holzer's Method –Basic Procedure –Transfer Matrix Procedure

UNIT - V

Introduction To Earthquake Analysis: Introduction –Excitation by Rigid Base Translation –Lumped Mass Approach -SDOF and MDOF System- I.S Code Methods of Analysis.

Continuous System: Introduction –Flexural Vibrations of Beams- Elementary Case-Equation of Motion –Analysis of Undamped Free Shapes of Simple Beams With Different End Conditions-Principles of Application To Continuous Beams.

Text Books:

1. Structural Dynamics for Earthquake Engineering,A.K.Chopra,Pearson Pubilications

2. Dynamics of Structures by Clough & Penziem
3. Structural Dynamics by Roy. R. Craig John willy & fours.

Reference Books:

1. Structural Dynamics by Mario Paz
2. I.S:1893(Part 1):2016 Code of Practice for Earthquakes Resistant Design of Stuctures.
3. Fundamentals of Vibration, Anderson R.A, Amerind Pulblishing Co.,1972.

Course Code	FINITE ELEMENT METHODS FOR STRUCTURAL ENGINEERING	L	T	P	C
		3	0	0	3
Semester		II			

Course Objectives:

1 To provide an overview and basic fundamentals of Finite Element Analysis.
2 To introduce basic aspects of finite element theory, including domain discretization, interpolation, application of boundary conditions, assembly of global arrays, and solution of the resulting algebraic systems.
3 To explain the underlying concepts behind variational methods and weighted residual methods in FEM.
4 Formulate simple structural problems in to finite elements

Course Outcomes (CO):

On successful completion of the course, the students will able to:
1 Analyse and build FEA models for various Engineering problems.
2 Able to identify information requirements and sources for analysis , design and evaluation
3 Use professional-level finite element software to solve engineering problems.
4 Interpret results obtained from FEA software solutions, not only in terms of conclusions but also awareness of limitations.

UNIT - I **INTRODUCTION**

Concepts of FEM –Steps Involved –Merits &Demerits –Energy Principles –Discretization – Rayleigh –Ritz Method of Functional Approximation. **Elastic Formulations:** Stress Equations-Strain Displacement Relationships in Matrix Form-Plane Stress, Plane Strain and Axi-Symmetric Bodies of Revolution With Axi Symmetric Loading

UNIT - II **ONE DIMENSIONAL FEM**

Stiffness Matrix for Beam and Bar Elements Shape Functions for ID Elements –Static Condensation of Global Stiffness Matrix-Solution –Initial Strain and Temperature Effects.

UNIT - III **TWO DIMENSIONAL FEM**

Different Types of Elements for Plane Stress and Plane Strain Analysis –Displacement Models –Generalized Coordinates-Shape Functions-Convergent and Compatibility Requirements –Geometric Invariance –Natural Coordinate System-Area and Volume Coordinates-Generation of Element Stiffness and Nodal Load Matrices –Static Condensation.

UNIT - IV

Isoparametric Formulation-Concept, Different Isoparametric Elements for 2D Analysis-Formulation of 4-Noded and 8-Noded Isoparametric Quadrilateral Elements –Lagrangian Elements-Serendipity Elements.
Axi Symmetric Analysis –Bodies of Revolution-Axi Symmetric Modelling –Strain Displacement Relationship-Formulation of Axi Symmetric Elements.

UNIT - V **THREE DIMENSIONAL FEM**

Different 3-D Elements, 3D Strain –Displacement Relationship- Formulation of Hexahedral and Isoparametric Solid Element.

Text Books:

1. Finite Elements Methods in Engineering by Tirupati. R. Chandrnpatla and Ashok D. Belegundu – Pearson Education Publications.
2. Finite Element Analysis – Theory & Programming by C.S.Krishna Murthy- Tata Mc.Graw Hill Publishers
3. Finite Element Analysis by S.S. Bhavakatti-New Age International Publishers

Reference Books:

1. Finite Element Method and Its Application by Desai ,2012, Pearson Pubilications.
2. finite Element Methods by Darrel W.Pepper, Vikas Pubilishers
3. Finite Element Analysis and Procedures in Engineering by H.V.Lakshminaryana, 3rd Edition, Universities Press, Hyderabad.
4. Finite Element Analysis in Engineering Design by S.Rajasekharan, S.Chand Publications, New Delhi.
5. Finite Element Analysis by P Seshu-PHI Learning Publications.

Course Code	ADVANCED REINFORCED CONCRETE DESIGN (PE-III)	L	T	P	C
		3	0	0	3
Semester		II			

Course Objectives:

1. To design of reinforced concrete beam
2. To design of reinforced concrete slab
3. To analyze and design of multi storey building and Industrial Building
4. To design special structures such as Deep beams, Corbels and Grid Floors

Course Outcomes (CO):

On successful completion of the course, the students will able to:

1. Design the strength and serviceability of reinforced concrete elements
2. Design special reinforced concrete elements
3. Analyse and design of slabs and grid floor
4. Design the inelastic behaviour of concrete beams

UNIT - I

Deflection of Reinforced Concrete Beams and Slabs:
Introduction -Short-Term Deflection of Beams and Slabs -Deflection Due To -Imposed Loads - Short- Term Deflection of Beams Due To Applied Loads- Calculation of Deflection by IS 456 - Calculation of Deflection by BS 8110 - Deflection Calculation by Eurocode – ACI Simplified Method - Deflection of Continuous Beams by IS 456 - Deflection of Cantilevers - Deflection of Slabs

Estimation of Crack Width in Reinforced Concrete Members: Introduction - Factors Affecting Crack width in Beams - Mechanism of Flexural Cracking Calculation of Crack Widths - Simple Empirical Method - Estimation of Crack width in -Beams by IS 456 of BS 8110 - Shrinkage and Thermal Cracking.

UNIT - II **Design of Reinforced Concrete Deep Beams:**

Introduction – Minimum Thickness – Steps of Designing deep beams- Design by IS 456- Design according to British Practice – ACI Procedure for design of deep beams – Checking for local failures – Detailing of deep beams

UNIT - III

Shear in Flat Slabs and Flat Plates:
Introduction - Checking for One-Way (Wide Beam) Shear - Two-Way (Punching) Shear Permissible Punching Shear - Shear Due To Unbalanced Moment (Torsional Moments) Calculation of J Values - Strengthening of Column Areas for Moment Transfer by Torsion Which Produces Shear - Shear Reinforcement Design - Effect of Openings in Flat Slabs - Recent Revisions in ACI 318 - Shear in Two – Way Slabs With Beams.

UNIT - IV

Design of Plain Concrete Walls and Shear Walls:
Introduction - Braced and Unbraced Walls - Slenderness of Walls- Eccentricities of Vertical Loads At Right Angles To Wall - Empirical Design Method for Plane Concrete Walls Carrying Axial Load - Design of Walls for In-Plane Horizontal Forces - Rules for Detailing of Steel in Concrete Walls

Design of Shear Walls:
Introduction - Classification of Shear Walls - Classification According To Behavior - Loads in Shear Walls - Design of Rectangular and Flanged Shear Walls - Derivation of Formula for Moment of Resistance of Rectangular Shear Walls

UNIT - V	
Design of Reinforced Concrete Members for Fire Resistance : Introduction - ISO 834 Standard Heating Conditions- Grading Or Classification - Effect of High Temperature on Steel and Concrete - Effect of High Temperatures on Different Types of Structural Members - Fire Resistance by Structural Detailing From Tabulated Data - Analystical Determination of The Ultimate Bending Moment Capacity of Reinforced Concrete Beams Under Fire - Other Considerations	
Text Books:	
1. Reinforced Concrete Structural Elements: Behaviour, Analysis and Design, P.Purushothaman, Tata Mcgraw Hill. 2. Reinforced Concrete Desigers Hand Bood, C.E. Reynolds and J.C. Steedman, A View Point Publication. 3. Advanced Reinforced Concrete Design , Varghese PC, Prentice Hall of India,2008	
Reference Books:	
1. Limit State Design of Reinforced Concrete Structures by P.Dayaratnam, Oxford & Ibh Publishers. 2. Advanced RCC by N.Krishna Raju, Cbs Publishers & Distributors. 3. Reinforced Cement Concrete Structures – Devdas Menon & Unnikrishna Pillai, Tata Mcgraw Hill	

Course Code	DESIGN OF PRESTRESSED CONCRETE (PE-III)	L	T	P	C
		3	0	0	3
Semester		II			

Course Objectives:

1. Familiarize students with concrete of prestressing and analysis of prestress
2. Design and analysis of pretension and post tensioned concrete memebers
3. Determination of deflections of prestressed members
4. To calculate the losses of prestress, creep and shrinkage.

Course Outcomes (CO):

On successful completion of the course, the students will able to:

1. To understand the basic concepts about prestressed concrete and analysis of prestress
2. Estimate the effective losses in prestress
3. Analyse the effect of prestressing force in the beahviour of beams in flexure
4. To design shear, torsion and transmission length in prestressed concrete members
5. Design of compression and tension members as per codes of practice

UNIT - I

Introduction: Development of Prestressed Concrete –Advantages and Disadvantages of PSC Over RCC –General Principles of Pre-Stressing-Pre Tensioning and Post Tensioning – Materials Used in PSC-High Strength Concrete –High Tension Steel-Different Types /Methods/Systems of Prestressing. Analysis of Sections for Flexure in Accordance With Elastic Theory-Allowable Stresses-Design Criteria As Per I.S Code of Practice –Elastic Design of Beams (Rectangular, I and T Sections) for Flexure –Introduction To Partial Prestressing

UNIT - II

Losses of Prestress: Estimation of The Loss of Prestress Due To Various Causes Like Elastic Shortening of Concrete ,Creep of Concrete, Shrinkage of Concrete, Relaxation of Steel, Slip in Anchorage and Friction

UNIT - III

Deflections: Introduction-Factors Influencing Deflections-Short Term and Long Term Deflections of Un-cracked members- Short Term and Long Term Deflections of Cracked Members.

Shear: Shear in PSC Beams –Principal Stresses –Conventional Elastic Design for Shear-Transfer of Prestress in Pre-tensioned Members

UNIT - IV

End blocks: Transmission length –Bond stresses-bearing at anchorage –Anchorage zone stresses in post-tensioned members-Analysis and design of end blocks by Guyon, Magnel and approximate methods –Anchorage zone reinforcements.

UNIT - V

Statically Indeterminate Structures: Introduction –Advantages and Disadvantages of Continuity –Layouts for Continuous Beams-Primary
and Secondary Moments –Elastic Analysis of Continuous Beams-Linear Transformation-Concordant Cable Profile-Design of Continuous Beams

Text Books:

1. Prestressed Concrete by N. Krishna Raju, 6th Edition, TMH Pubilishers.
2. Prestressed Concrete by K.U.Muthu, PHI Learning Private Limited.
3. Prestressed Concrete Design by Praveen Nagarajan, Pearson Pubilications.

Reference Books:

1. Design of Prestressed Concrete Structures, T.Y.Lin and Ned H. Burns, Wiley Publishing House.
2. Prestressed Concrete, Vol.I&II, Y.Guyon, Wiley and Sons, 1960.
3. Prestressed Concrete, Edward P.Nawy, Prentice Hall –.
4. Prestressed Concrete – by N. Rajagopalan, Narosa Pubilishing House

Course Code	ANALYSIS OF SHELLS AND FOLDED PLATES (PE-III)	L	T	P	C
		3	0	0	3
Semester		II			

Course Objectives:

1.To know the principles of membrane theory and bending theory.
2.To know the principles of cylindrical shells.
3.To know the principles of shells of double curvature other than shells of revolution.
4.To know the principles of folded plates
5. To know the principles of shells of double curvature shells of revolution

Course Outcomes (CO):

On successful completion of the course, the students will able to:
1.To derive stress resultants.
2.To derive the governing differential equations for cylindrical shells.
3.To derive the governing differential equations for shells of double curvature other than shells of revolution.
4. To analyse the folded plates.
5.To analyse the shells of double curvature for shells of revolution.

UNIT - I

Equations of equilibrium : Introduction, classification, derivation of stress Resultants, Principles of membrane theory and bending theory.

UNIT - II

Cylindrical shells: Derivation of governing DKJ equation for bending theory, details of Schorer's theory, Applications to the analysis and design of short shells and long shells. Introduction of ASCE manual co-efficients for design.

UNIT - III

Introduction to shells of double curvature: (other than shells of revolution:) Geometry and analysis of elliptic paraboloid, rotational paraboloid and hyperbolic paraboloid shapes by membrane theory.

UNIT - IV

Folded Plates: Folded plate theory, plate and slab action, Whitney's theory, Simpson's theory for the analysis of different types of folded plates (Design is not included)

UNIT - V

Shells of double Curvature-Surfaces of revolution .Derivation of equilibrium equations by membrane theory, Applications to spherical shell and rotational Hyperboloid

Text Books:

1. Design and construction of concrete shell roofs by G.S. Rama Swamy – CBS Publishers & Distributors, 485, Jain Bhawan Bhola Nath Nagar, shahotra, Delhi.
2. Fundamentals of the analysis and design of shell structures by Vasant S.kelkar Robert T.Swell – Prentice hall, Inc., Englewood cliffs, new Jersy -02632.
3. N.k.Bairagi, Shell analysis, Khanna Publishers, Delhi, 1990.

Reference Books:

1. Billington, Ithin shell concrete structures, Mc Graw Hill Book company, New york, St. Louis, Sand Francisco, Toronto, London.
2. ASCE Manual of Engineering practice No.31, design of cylindrical concrete shell roofs ASC, Newyork

3. Theory of Plates & Shells –Stephen, P.Timoshenko, S.Woinowsky-Krieger – Tata MC Graw Hill Edition
4. Analysis and design of concrete shell roofs by G.S.Ramaswami. CBS publications.
5. Shell Analysis by N.K.Bairagi. Khanna Publishers, New Delhi.

Course Code	STABILITY OF STRUCTURES (PE-IV)	L	T	P	C
		3	0	0	3
Semester		II			

Course Objectives:

1. Determine stability of columns and frames
2. Determine stability of beams and plates
3. Use stability criteria and concepts for analyzing discrete and continuous systems,
4. To form differential equations for plate buckling

Course Outcomes (CO):

On successful completion of the course, the students will able to:

1. Apply the torisonal buckling and platesfor buckling concept
2. Apply the inelastic behaviour of materials and analyse the inelastic charecter of column
3. Analyse the frame structures
4. Analyse the plate structures

UNIT - I	FORMULATIONS RELATED TO BEAM COLUMNS :

Concept of Stability, Differential Equation for Beam Columns –Beam Column With Concentrated Loads –Continuous Lateral Load –Couples -Beam Column With Built in Ends –Continuous Beams With Axial Load –Application of Trignometric Series –Determination of Allowable Stresses.

UNIT - II	ELASTIC BUCKLING OF BARS:

Elastic Buckling of Straight Columns –Effect of Shear Stress on Buckling-Eccentrically and Laterally Loaded Columns –Energy Methods –Buckling of A Bar on Elastic Foundation, Buckling of A Bar With Intermediate Compressive Forces and Distributed Axial Loads – Buckling of Bars With Change in Cross Section –Effect of Shear Force on Critical Load – Built Up Columns

UNIT - III	INELASTIC BUCKLING AND TORSIONAL BUCKLING :

Buckling of Straight Bars-Double Modulus Theory –Tangent Modulus Theory. Pure Torsion of Thin Walled Bar of Open Cross Section-Non –Uniform Torsion of Thin Walled Bars of Open Cross Section-Torsional Buckling –Buckling Under Torsion and Flexure.

UNIT - IV	MATHEMATICAL TREATMENT OF STABILITY PROBLEMS:

Buckling Problem Orthogonality Relation –Ritz Method-Timoshenko Method, Galerkin Method

UNIT - V	LATERAL BUCKLING OF SIMPLY SUPPORTED BEAMS AND RECTANGULAR PLATES :

Beams of Rectangular Cross Section Subjected for Pure Bending. Derivation of Equation of Rectangular Plate Subjected To Constant Compression in Two Directions and One Direction.

Text Books:

1. Stability of Metalic Structure by Bleich –Mc Graw Hill
2. Theory of Beam Columns Vol I by Chen & Atsuta Mc.Graw Hill
3. Theory of Elastic Stability, Timoshenko, S., and Gere., Mc Graw Hill Book Company, 1973.

Reference Books:

1. Elastic Stability of Structures, Smitses, Prentice Hall,1973.
2. Buckling of Bars Plates and Shells, Brush and Almorth., Mc Graw Hill Book Company ,1975.

3. Principles of Structural Stability Theory, Chajes, A., Prentice Hall,1974
4. Stability Theory of Structures, Ashwini Kumar, TATA Mc Graw Hill Publishing Company Ltd, New Delhi,1985.

Course Code	ADVANCED STEEL DESIGN (PE-IV)	L	T	P	C
		3	0	0	3
Semester		II			

Course Objectives:

1.To introduce structural steel fasteners like welding and bolting
2. To introduce steel structures and its basic components like eccentric and moment connections
3. To introduce the structural steel components of industrial building.
4.To introduce tension members, compression members, beams and beam-columns
5. To introduce the fundamental of steel structures and calculate the plastic moment of different cross-sections

Course Outcomes (CO):

On successful completion of the course, the students will able to:
1. Learn the fundamentals of structural steel fasteners
2.Learn the basic elements of a steel structure
3.Classify and design the structural steel components of industrial building.
4.Able to design tension members, compression members, beams and beam-columns
5.Explain the fundamental of steel structures and calculate the plastic moment of different cross-sections.

UNIT - I	SIMPLE CONNECTIONS – RIVETED, BOLTED PINNED AND WELDED CONNECTIONS:

Riveted Connections – Bolted Connections –Load Transfer Mechanism – Failure of Bolted Joints – Specifications for Bolted Joints – Bearing – Type Connections – Tensile Strength of Plate – Strength and Efficiency of the Joint – Combined Shear and Tension – Slip-Critical connections – Prying Action – Combined Shear and Tension for Slip-Critical Connections. Design of Groove Welds - Design of Fillet Welds – Design of Intermittent Fillet Welds – Failure of Welds.

UNIT - II	ECCENTRIC AND MOMENT CONNECTIONS:

Introduction – Beams – Column Connections – Connections Subjected to Eccentric Shear – Bolted Framed Connections –Bolted Seat Connections – Bolted Bracket Connections. Bolted Moment Connections – Welded Framed Connections- Welded Bracket Connections – Moment Resistant Connections.

UNIT - III	ANALYSIS AND DESIGN OF INDUSTRIAL BUILDINGS:

Dead loads, live loads and wind loads on roofs. Design wind speed and pressure, wind pressure on roofs; wind effect on cladding and louvers; Design of angular roof truss, tubular truss, truss for a railway platform. Design of purlins for roofs, design of built up purlins, design of knee braced trusses and stanchions. Design of bracings.

UNIT - IV	DESIGN OF STEEL TRUSS GIRDER BRIDGES:

Types of truss bridges, component parts of a truss bridge, economic Proportions of trusses, self weight of truss girders, design of bridge Compression members, tension members; wind load on truss girder Bridges; wind effect on top lateral bracing; bottom lateral bracing; portal Bracing; sway bracing Design of Lacing.

UNIT - V	PLASTIC ANALYSIS AND DESIGN :

Introduction – Plastic Theory – Plastic neutral Axis plastic moment, Elastic & Plastic Section modulii shape factors plastic Hinge – Fundamental condition conditions in plastic analysis, methods of plastic analysis – collapse load – simply supported, propped cantilever beam, fixed beams continuous beams, portal frame single bay single storey portal frame at different level subjected to vertical and horizontal loads, Method of instantaneous center gable frame –

Trial and effort method – plastic moment distribution method – continuous beam, two bay-single story portal frame – Deflections and ultimate load propped cantilever beam fixed beam minimum weight design continuous beams and single bay-single storey portal frame.
Text Books:
1. Plastic Analysis of Structures by B.G.Neal 2. Steel Skeleton V.I and II by Baker 3. Design of Steel Structures by Vazarani and Ratwani
Reference Books:
1. Strength of Materials (Vol-II)) by Timoshenko. 2. Analysis of Steel Structure by Manohar. 3. Analysis of Steel Structure by Pinfold 4. Analysis of Steel Structure by Arya & Azmani 5. Analysis of Steel Structure by Relevant IS Codes. 6. Analysis of Steel Structure by Punmia, B.C.

Course Code	FRACTURE MECHANICS (PE-IV)	L	T	P	C
		3	0	0	3
Semester		II			

Course Objectives:

1. To design based on linear elastic fracture mechanics
2. To find out the variation of plastic zone over thickness of various elements
3. To know about the plane strain and plane stress in slip planes
4. To understand the fracture process of concrete and different materials

Course Outcomes (CO):

On successful completion of the course, the students will able to:

1. Acquire basic skills in fracture mechanism of brittle materials
2. Apply fracture mechanics theory to calculate stress areas
3. Calculate the "energy release rate" around crack tips
4. Examine crack growth due to fatigue

UNIT - I **SUMMARY OF BASIC PROBLEMS AND CONCEPTS:**

Introduction - A Crack in A Structure - The Stress At A Crack Tip - The Griffith Criterion The Crack Opening Displacement Criterion - Crack Propagation - Closure

UNIT - II **THE ELASTIC CRACK – TIP STRESS FIELD :**

The Airy Stress Function - Complex Stress Functions - Solution To Crack Problems - The Effect of Finite Size - Special Cases - Elliptical Cracks - Some Useful Expressions

UNIT - III **THE CRACK TIP PLASTIC ZONE:**

The Irwin Plastic Zone Correction - The Dugdale Approach - The Shape of The Plastic Zone - Plane Stress Versus Plane Strain - Plastic Constraint Factor - The Thickness Effect

UNIT - IV

The Energy Principle:

The Energy Release Rate - The Criterion for Crack Growth - The Crack Resistance (R Curve) - Compliance , The J Integral (Definitions Only)

Plane Strain Fracture Toughness:

The Standard Test - Size Requirements - Non-Linearity – Applicability

Plane Stress and Transitional Behaviour:

Introduction - An Engineering Concept of Plane Stress - The R Curve Concept

UNIT - V

The Crack Opening Displacement Criterion:

Fracture Beyond General Yield - The Crack Tip Opening Displacement - The Possible Use of The CTOD Criterion

Determination of Stress Intensity Factors:

Introduction - Analytical and Numerical Methods - Finite Element Methods, Experimental Methods (An Ariel Views Only)

Text Books:

1. Elementary Engineering Fracture Mechanics - David Broek, Battelle, Columbus Laboratories, Columbus, Ohieo, USA
2. Fracture and Fatigue Control in Structures - John M.Barsom, Stanley T.Rolfe, Ross H.Forney
3. Rock and other Quasi-brittle materials - Surender P Shah , Stuart E Swartz,Wiley 1995.

Reference Books:

1. Analysis of Concrete Structures by fracture mechanics, Elfgren L, Routledge,1990
2. Fracture Mechanics- Applications to concrete, Victor C.Li and Z P Bazant , ACI SP118
3. Fracture Mechanics , CT Suri and Zh jin , Elsevier Academic Press,2012

Course Code	ADVANCED CONCRETE LABORATORY – II	L	T	P	C
		3	0	0	3
Semester		II			

Course Objectives:

1.To study the mix design
2.To do Strength and Split Tensile Strength Properties of High Strength Concrete (M60).
3.Familiar with the Self Compacting Concrete.
4.Knowledge about advance tests on concrete

Course Outcomes (CO):

On successful completion of the course, the students will able to:
1. the mix design
2. Strength and Split Tensile Strength Properties of High Strength Concrete (M60).
3. The Self Compacting Concrete.
4. TO gain Knowledge about advance tests on concrete

LIST OF EXPERIMENTS:

1. Mix design and Fresh Properties of High Strength Concrete (M60).
2. Compression Strength and Split Tensile Strength Properties of High Strength Concrete (M60).
3. Flexural Strength Properties of High Strength Concrete (M60).
4. Mix Design and L – Box Test on Self Compacting Concrete.
5. Mix Design and U – Box Test on Self Compacting Concrete
6. Mix Design and V Funnel Test on Self Compacting Concrete
7. Compression Strength and Split Tensile Strength Properties of Self Compacting Concrete.
8. Flexural Strength Properties of Self Compacting Concrete.
9. Mix Design and Fresh Properties of Light Weight Concrete.
10. Compression Strength and Split Tensile Strength Properties of Light Weight Concrete.
11. Flexural Strength Properties of Light Weight Concrete.
12. Permeability Test on Hardened Concrete.
13. Impact Testing on Hardened Concrete Specimen.
14. Compression test on RCC Columns

Course Code	COMPUTER AIDED DESIGN LABORATORY – II	L	T	P	C
		3	0	0	3
Semester		II			

Course Objectives:

1. Demonstrate the design of truss bridge.
2. Demonstrate RC multi-storey buildingfor gravity and wind loads
3.Explain analysis of a building for various loading.
4.Demonstrate the method of analysis of water tank.

Course Outcomes (CO):

On successful completion of the course, the students will able to:
1. Analyze and design of truss bridge
2. Analyze and design RC multi-storey buildingfor gravity and wind loads
3. Analyze for earthquake loading & wind loading of framed buildings.
4.Analyze and design of water tank, bearing structures, Bridge Girder

LIST OF EXPERIMENTS:

1. Analysis and design of truss bridge
2. Analysis of Pre-engineered building
3. Analysis and design of RC multi-storey buildingfor gravity and wind loads.
4. Analysis and design of RC multi-storey buildingfor gravity and seismic loads
5. Analysis and design of RC multi-storey framed building with shear wall for lateral load
6. Analysis and designof flatslabsystem for multistorey building
7. Analysis and DesignofGantrygirdersforindustrialstructures
8. Analysis of Bridge for various Loads
9. Design of Bridge Girder Structure
10. Design of Bridge Pier Section
11. Analysis and design of Bearings
12. Analysis and design of RC elevated water tank

Course Code	DISASTER MANAGEMENT	L	T	P	C
		2	0	0	0
	Semester	II			

Course Objectives

1. Learn to demonstrate critical understanding of key concepts in disaster risk reduction and humanitarian response.
2. Critically evaluate disaster risk reduction and humanitarian response policy and practice from Multiple perspectives.
3. Develop an understanding of standards of humanitarian response and practical relevance in specific types of disasters and conflict situations
4. Critically understand the strengths and weaknesses of disaster management approaches, planning and programming in different countries, particularly their home country or the countries they work in

UNIT -I **INTRODUCTION:**

Disaster: Definition, Factors and Significance; Difference Between Hazard and Disaster; Natural and Manmade Disasters: Difference, Nature, Types and Magnitude.

Disaster Prone Areas in India:

Study of Seismic Zones; Areas Prone to Floods and Droughts, Landslides and Avalanches; Areas Prone to Cyclonic and Coastal Hazards with Special Reference to Tsunami; Post-Disaster Diseases and Epidemics

UNIT - II **REPERCUSSIONS OF DISASTERS AND HAZARDS**:

Economic Damage, Loss of Human and Animal Life, Destruction of Ecosystem. Natural Disasters: Earthquakes, Volcanisms, Cyclones, Tsunamis, Floods, Droughts and Famines, Landslides and Avalanches, Man-made disaster: Nuclear Reactor Meltdown, Industrial Accidents, Oil Slicks and Spills, Outbreaks of Disease and Epidemics, War and Conflicts.

UNIT - III **DISASTER PREPAREDNESS AND MANAGEMENT:**

Preparedness: Monitoring of Phenomena Triggering A Disaster or Hazard; Evaluation of Risk: Application of Remote Sensing, Data from Meteorological and Other Agencies, Media Reports: Governmental and Community Preparedness.

UNIT - IV **RISK ASSESSMENT DISASTER RISK:**

Concept and Elements, Disaster Risk Reduction, Global and National Disaster Risk Situation. Techniques of Risk Assessment, Global Co-Operation in Risk Assessment and Warning, People's Participation in Risk Assessment. Strategies for Survival.

UNIT - V **DISASTER MITIGATION:**

Meaning, Concept and Strategies of Disaster Mitigation, Emerging Trends In Mitigation. Structural Mitigation and Non-Structural Mitigation, Programs of Disaster Mitigation in India.

Suggested Reading

1. R.Nishith, Singh AK, "Disaster Management in India: Perspectives, issues and strategies" New Royal book

Course Code	**STRESS MANAGEMENT BY YOGA**	**L**	**T**	**P**	**C**
		2	**0**	**0**	**0**
	Semester	**II**			

Course Objectives: This course will enable students

1. To achieve overall health of body and mind
2. To overcome stress

Course Outcomes(CO):

On successful completion of the course, the students will able to:

1. Develop healthy mind in a healthy body thus improving social health also
2. Improve efficiency

UNIT -I

Definitions of Eight parts of yoga.(Ashtanga)

UNIT - II

Yam and Niyam.

UNIT - III

Do`s and Don'ts inlife.

i) Ahinsa, satya, astheya, bramhacharya and aparigraha
ii) Shaucha, santosh, tapa, swadhyay, ishwarpranidhan

UNIT - IV

Asanand Pranayam

UNIT - V

i) Various yoga poses and their benefits for mind & body
ii) Regularization of breathing techniques and its effects-Types of pranayam

SuggestedReading

1.'Yogic Asanas for Group Training-Part-I":Janardan Swami Yoga bhyasi Mandal, Nagpur
2."Rajayoga or conquering the Internal Nature" by SwamiVivekananda, Advaita Ashrama (Publication Department), Kolkata

Course Code	EARTHQUAKE RESISTANT DESIGN OF BUILDINGS (PE-V)	L	T	P	C
		3	0	0	3
Semester		II			

Course Objectives:

1. To understand effects of earthquakes on engineering structures and its measurement
2. To apply dynamics loadson various structures
3. To design buildings for earthquake loads as per IS Codes
4. To understand and implement the concept of ductility in Earthquake Resistant Design

Course Outcomes (CO):

On successful completion of the course, the students will able to:

1. Illustrate the measurement of earthquakes and their effect on engineering structures
2. Analyse the free and forced vibration response of single degree and multi degree of freedom and continuous systems
3. Apply the basic principles of conceptual design of Earthquake Resistant buildings
4. Learn the various seismic control methods

UNIT - I **ENGINEERING SEISMOLOGY :**

Earthquake – Causes of Earthquake – Earthquakes and Seismic Waves – Scale and Intensity of Earthquakes – Seismic Activity – Measurements of Earth Quakes – Seismometer- Strong Motion Accelerograph / Field Observation of Ground Motion – Analysis of Earthquakes Waves – Earth Quake Motion – Amplification of Characteristics of Surface Layers – Earthquake Motion on The Ground Surface

UNIT - II **VIBRATION OF STRUCTURES UNDER GROUND MOTION:**

Elastic Vibration of Simple Structures – Modelling of Structures and Equations of Motion – Free vibrations of Simple Structures – Steady State Forced Vibrations – Non Steady State Forced Vibrations – Response Spectrum Representations; Relation Between The Nature of The Ground Motion and Structural Damage.

UNIT - III

Lateral Force Procedure Seismic Base Shear – Seismic Design Co-Efficient - Vertical Distribution of Seismic Forces and Horizontal Shear – Twisting Moment - Over Turning Moment – Vertical Seismic Load and Orthogonal Effects Lateral Deflection – P- Δ Characteristics Effect – Soil Structure Interaction. Seismic – Graphs Study, Earthquake Records for Design – Factors Affecting Accelerogram Characteristics - Artificial Accelerogram – Zoning Map. Dynamic – Analysis Procedure: Model Analysis – Inelastic – Time History Analysis Evaluation of the Results.

UNIT - IV **EARTHQUAKE – RESISTANT DESIGN OF STRUCTURAL COMPONENTS AND SYSTEMS:**

Introduction – Monolithic Reinforced – Concrete Structures – Precast Concrete Structures – Prestressed Concrete Structures – Steel Structures – Composite – Structures, Masonry Structures – Timber Structures.

UNIT - V

Fundamentals of Seismic Planning: Selection of Materials and Types of Construction Form of Superstructure – Framing Systems and Seismic Units – Devices for Reducing. Earthquake Loads.

Text Books:

1. Design of Earthquake Resistant Structures by Minoru Wakabayashi.

2. Strucutural Dynamics for Earthquake Engineering", A.K.Chopra,Pearson Pubilications.
3. Dynamics of Structures. R.W.Clough, Mc Graw – Hill, 2nd Edition,

Reference Books:

1.Fundamentals of Earthquake Engineering,N.M Newmark and E.Rosenblueth, Prentice Hall,1971.
2.Earthquake Design Practice for Buildings. David Key," Thomas Telford,London,1988
3.Earthquake Engg; R.L. Wegel, Prentice Hall 12nd Edition 1989.
4.Design of Multi –Storied Buildings for Earthquake Ground Motions J.A. Blume, N.M. Newmark, L.H. Corning.,', Portland Cement Association, Chicago,1961
5.I.S.Codes No. 1893,4326,13920.
6.Earthquake Resistant Design by Pankaj Agarwal.

Course Code	COST EFFECTIVE HOUSING TECHNIQUES (PE- V)	L	T	P	C
		3	0	0	3
Semester		II			

Course Objectives:

1. To possess comprehensive knowledge of planning, design, evaluation, construction and financing of housing projects.
2. To focuses on cost effective construction materials and methods.
3. To understand on the principles of sustainable housing policies and programmes.
4. to adopt the suitable techniques in rural and disaster prone areas by using locally available materials.

Course Outcomes (CO):

On successful completion of the course, the students will able to:

1 Development of construction technology and innovative techniques as tools to address demand mass construction
2 Knowledge of eco friendly material with their application
3 Learn the use of locally available material according to their availability and maintenance

UNIT - I

Housing Scenario

Introduction - Status of Urban Housing - Status of Rural Housing

Housing Finance:

Introducing - Existing Finance System in India - Government Role As Facilitator - Status At Rural Housing Finance - Impedimently in Housing Finance and Related Issues

Land Use and Physical Planning for Housing

Introduction - Planning of Urban Land - Urban Land Ceiling and Regulation Act - Efficiency of Building Bye Lass - Residential Densities

Housing The Urban Poor

Introduction - Living Conditions in Slums - Approaches and Strategies for Housing Urban Poor

UNIT - II

Development and Adoption of Low Cost Housing Technology

Introduction - Adoption of Innovative Cost Effective Construction Techniques - Adoption of Precast Elements in Partial Prefatroices - Adopting of Total Prefactcation of Mass Housing in India- General Remarks on Pre Cast Rooting/Flooring Systems -Economical Wall System - Single Brick Thick Loading Bearing Wall - 19cm Thick Load Bearing Masonery Walls - Half Brick Thick Load Bearing Wall - Flyash Grypsym Thick for Masonry - Stone Block Masonery - Adoption of Precast R.C. Plank and Join System for Roof/Floor in The Building

UNIT - III

Alternative Building Materials for Low Cost Housing

Introduction - Substitute for Scarce Materials – Ferrocement - Gypsum Boards - Timber Substitutions - Industrial Wastes - Agricultural Wastes - Fitire Starateru; for ,P,Topm of Alternative Building Maintenance

Low Cost Infrastructure Services:

Introduce - Present Status - Technological Options - Low Cost Sanitation - Domestic Wall - Water Supply, Energy

UNIT - IV

Rural Housing:

Introduction Traditional Practice of Rural Housing Continuous - Mud Housing Technology Mud Roofs - Characteristics of Mud - Fire Treatment for Thatch Roof - Soil Stabilization - Rural Housing Programs

UNIT - V

Housing in Disaster Prone Areas:

Introduction – Earthquake - Damages To Houses - Traditional Prone Areas - Type of Damages and Railways of Non-Engineered Buildings - Repair and Restore Action of Earthquake Damaged Non-Engineered Buildings Recommendations for Future Constructions. Requirement's of Structural Safety of Thin Precast Roofing Units Against Earthquake Forces, Status of R&D in Earthquake Strengthening Measures - Floods, Cyclone, Future Safety

Text Books:

1. Building Materials for Low –Income Houses – International Council for Building Research Studies and Documentation.
2. Hand Book of Low Cost Housing by A.K.Lal – Newage International Publishers.
3. Modern Trends in Housing in Developing Countries – A.G. Madhava Rao, D.S. Ramachandra Murthy & G.Annamalai.

Reference Books:

1. Properties of Concrete – Neville A.M. Pitman Publishing Limited, London.
2. Light Weight Concrete, Academic Kiado, Rudhai.G – Publishing Home of Hungarian Academy of Sciences 1963.
3. Low Cost Housing – G.C. Mathur.

Course Code	BUILDING CONSTRUCTION MANAGEMENT (PE- V)	L	T	P	C
		3	0	0	3
Semester		II			

Course Objectives:

1. To create construction project cost estimates.
2. Analyze construction documents for planning and management of construction processes.
3. Understand the legal implications of contract, common, and regulatory law to manage a construction project.
4. Understand different methods of project delivery and the roles and responsibilities of all constituencies involved in the design and construction process.

Course Outcomes (CO):

On successful completion of the course, the students will able to:

1. Plan, coordinate and control of a project from beginning to completion.
2. Adopting the most effect method for meeting the requirement in order to produce a functionally and financially viable project.
3. Implement different methods of project delivery
4. Follow the legal provisions implied

UNIT - I

Introduction – Types Constructions Public and Private Contract Management – Scrutinizing Tenders and Acceptance of Tenders, Contracted, Changes and Terminating of Contract – Subcontracts Construction Organizations – Organizational Chart-Decentralization Payrolls and Records – Organization Chart of A Construction Company.

UNIT - II

Construction Practices – Times Management – Bar Chart, CPM, PERT – Progress Report

UNIT - III

Resources Management and Inventor- Basic Concepts Equipment Management, Material Management Inventory Control.

UNIT - IV

Accounts Management – Basic Concepts, Accounting System and Book Keeping, Depreciation, Balance Sheet, Profit and Loss Account, Internal Auditing. Quality Control by Statistical Methods, Sampling Plan and Control Charts, Safety Requirements.

UNIT - V

Cost and Financial Management – Cost Volume Relationship, Cost Control System, Budget Concept of Valuation, Cost of Equity Capital Management Cash. Labor and Industrial; Laws – Payment of Wages Act. Contract Labor, Workmen's Compensation, Insurance, Industrial Disputes Act.

Text Books:

1. Construction Project Management by Jha ,Pearson Pubilications,New Delhi.
2. Construction Technology by Subir K.Sarkar and Subhajit Saraswati – Oxford Higher Education- Univ.Press, Delhi.

Reference Books:

1. Project Planning and Control With PERT and CPM by Dr.B.C.Punmia, K.K.Khandelwal, Lakshmi Publications New Delhi.
2. Optimal Design of Water Distribution Networks P.R.Bhave, Narosa Publishing House

2003.
3. Total Project Management, The Indian Context- by : P.K.JOY- Mac Millan Publishers India Limited.

Course Code	GREEN BUILDINGS (OE)	L	T	P	C
		3	0	0	3
Semester		II			

Course Objectives:

1. Exposure to the green building technologies and their significance.
2. Understand the judicial use of energy and its management.
3. Educate about the Sun-earth relationship and its effect on climate
4. Enhance awareness of end-use energy requirements in the society
5. Develop suitable technologies for energy management

Course Outcomes (CO):

On successful completion of the course, the students will able to:
1.Understand the fundamentals of energy use and energy processes in building
2. Identify the energy requirement and its management.
3. Know the Sun-earth relationship vis-a-vis its effect on climate.
4. Be acquainted with the end-use energy requirements.
5. Be familiar with the audit procedures of energy

UNIT - I

Introduction What is Green Building, Why to go for Green Building, Benefits of Green Buildings, Green Building Materials and Equipment in India, What are key Requisites for Constructing a Green Building, Important Sustainable features for Green Building,

UNIT - II

Green Building Concepts And Practices Indian Green Building Council, Green Building Moment in India, Benefits Experienced in Green Buildings, Launch of Green Building Rating Systems, Residential Sector, Market Transformation; Green Building Opportunities And Benefits: Opportunities of Green Building, Green Building Features, Material and Resources, Water Efficiency, Optimum Energy Efficiency, Typical Energy Saving Approach in Buildings, LEED India Rating System and Energy Efficiency

UNIT - III

Green Building Design Introduction, Reduction in Energy Demand, Onsite Sources and Sinks, Maximize System Efficiency, Steps to Reduce Energy Demand and Use Onsite Sources and Sinks, Use of Renewable Energy Sources. Ecofriendly captive power generation for factory, Building requirement.

UNIT - IV

Air Conditioning Introduction,CII Godrej Green business centre, Design philosophy, Design interventions, Energy modeling, HVAC System design, Chiller selection, pump selection, Selection of cooling towers, Selection of air handing units,Precooling of fresh air, Interior lighting system, Key feature of the building. Eco-friendly captive power generation for factory, Building requirement. Envelope design basics, ECBC compliant design strategy for a building, Compliance approaches viz. Prescriptive ,Whole building Performance and Trade off approaches. Introduction to Eco Nivas Samhitha (ENS) and software tool for checking building energy, carbon, lighting and comfort performance.

UNIT - V

Material Conservation Handling of non process waste, waste reduction during construction, materials with recycled content, local materials, material reuse, certified wood ,Rapidly renewable building materials and furniture; Indoor Environment Quality And Occupational Health: Air conditioning, Indore air quality, Sick building syndrome, Tobacco smoke control, Minimum fresh air requirements avoid use of asbestos in the building, improved fresh air

ventilation, Measure of IAQ, Reasons for poor IAQ, Measures to achieve Acceptable IAQ levels
Text Books:
1. Handbook on Green Practices published by Indian Society of Heating Refrigerating and Air conditioning Engineers, 2009. 2. Green Building Hand Book by Tomwoolley and Samkimings, 2009. 3. Complete Guide to Green Buildings by Trish riley
Reference Books:
1. Standard for the design for High Performance Green Buildings by Kent Peterson, 2009 2. Energy Conservation Building Code –ECBC-2020, published by BEE 3. "Eco Niwas Samhita -2021 " published by BEE

Course Code	RETROFITTING OF STRUCTURES (OE)	L	T	P	C
		3	0	0	3
Semester		II			

Course Objectives:

1. Quality assurance of concrete and Non- Destructive Testing.
2. Understand the concept of Cracks in Structures.
3. Identify the materials for repairs and maintenance.
4. Techniques to repairs and execution.
5. Procedure the procedure to strengthen the existing structures and structural elements.

Course Outcomes (CO):

On successful completion of the course, the students will able to:

1. Understand factors of Serviceability and Durability of Structures.
2. Determine crack width, effect of crack on materials, effect of moisture on structures.
3. Understand various materials and methodologies used for repairing of structures.
4. Understand and implement techniques used for repairing and maintenance of structure.
5. Understand the procedure to strengthen the existing structures and structural elements.

UNIT - I **Serviceability and Durability**

Quality Assurance for Concrete Construction, Permeability, Thermal Properties and Cracking, Distress Monitoring, Causes for Distress, Effects of Climate, Temperature, Chemicals, Wear and Erosion, Design and Construction Errors, Corrosion Mechanism, Effects of Cover Thickness and Cracking. **Non Destructive Testing:** Ultrasonic and Sonic Test, Rebound Hammer Test, Strength Evaluation of Existing Structures.

UNIT - II **Cracks in Structures**

Causes, Thermal and Shrinkage cracks, Cracks due to Vegetation and Trees, Foundation Movements, Types and their Fatality, Diagnosis Techniques for Repair. **Moisture Penetration:** Sources of Dampness, Moisture Movement from Ground, Reasons for Ineffective Damping, Leakage in Concrete Slabs, Pitched Roofs, Dampness in Solid Walls, Condensation, Remedial treatments, Chemical Coatings.

UNIT - III **Materials for Repairs & Maintenance**

Essential Parameters for Repair Material, Premixed Cement Concrete and Mortar, Sulphur Infiltrated Concrete, Fiber Reinforced Concrete, Special Elements for Accelerated Strength Gain, Expansive Cement. **Maintenance**: Definitions: Maintenance, Repair and Rehabilitation, Facets of Maintenance, Importance of Maintenance, Preventive Measures on Various Aspects Inspection.

UNIT - IV **Techniques for Repairs**

Repairs using Mortars and Dry Packs**,** Concrete Replacement, Surface Impregnation, Rust Eliminators and Polymers Coating for Rebar During Repair Foamed Concrete, Vacuum Concrete, Gunite and Shotcrete, Injection: Epoxy, Resin, Polymer Modified Cement Slurry; Shoring and Underpinning. Propping and Supporting: False Work, Requirement of Good False Work, Design Brief for False Work, Execution Procedure.

UNIT - V **Strengthening of Existing Structures**

General Principle, Relieving Loads, Stress Reduction, Strengthening of Super Structures (Beam, Column, Slab including Joints) for Tension, Compression, Flexural, and Shear respectively, Jacketing (RCC, Plate, Fiber ,Wrap), Bonded Overlays, Reinforcement Addition, Strengthening the Substructures, Increasing the Load Capacity of Footing, Strengthening of Masonry Structure.

Text Books:

1. Johnson. S.M., "Deterioration, maintenance and repair of structures", McGraw-Hill book company, New York, 1965.
2. Denison Campbell, Allen and Harold Roper, "Concrete structures", Materials, Maintenance and Repair, Longman Scientific and technical UK, 1991.

Reference Books:

1. Santhakumar, A.R., " Training Course notes on Damage Assessment and repair in Low Cost Housing RHDC–NBO " Anna University, July, 1992.
2. Raikar, R.N., “Learning from failures – Deficiencies in Design ", Construction and Service – R & D Centre (SDCPL), Raikar Bhavan, Bombay, 1987.

Course Code	OPERATION RESEARCH (OE)	L	T	P	C
		3	0	0	3
Semester		II			

Course Objectives:

1. Aims to use quantitative methods and techniques for effective decisions–making; model formulation and applications that are used in solving business decision problems.
2. To introduce Decision and Game Theory concepts for scientific study of strategic decision making.

Course Outcomes (CO):

On successful completion of the course, the students will able to:

1. Apply the dynamic programming to solve problems of discreet and continuous variables.
2. Apply the concept of non-linear programming
3. Carry out sensitivity analysis
4. Model the real-world problem and simulate it.

UNIT - I	**Optimization Techniques**:

Model Formulation, models, General L.R Formulation, Simplex Techniques, Sensitivity Analysis, Inventory Control Models

UNIT - II	**Formulation of a LPP:**

Formulation of a LPP - Graphical solution revised simplex method - duality theory - dual simplex method - sensitivity analysis - parametric programming.

UNIT - III	**Nonlinear programming problem:**

Nonlinear programming problem - Kuhn-Tucker conditions min cost flow problem - max flow problem - CPM/PERT

UNIT - IV	**Scheduling and sequencing**

Scheduling and sequencing - single server and multiple server models - deterministic inventory models - Probabilistic inventory control models - Geometric Programming.

UNIT - V	**Competitive Models:**

Competitive Models, Single and Multi-channel Problems, Sequencing Models, Dynamic Programming, Flow in Networks, Elementary Graph Theory, Game Theory Simulation

Text Books:

1. H.A. Taha, Operations Research, An Introduction, PHI, 2008
2. H.M. Wagner, Principles of Operations Research, PHI, Delhi, 1982.

Reference Books:

1. J.C. Pant, Introduction to Optimization: Operations Research, Jain Brothers, Delhi, 2008 4.
2. Hitler Libermann Operations Research: McGraw Hill Pub. 2009
3. Pannerselvam, Operations Research: Prentice Hall of India 2010
4. Harvey M Wagner, Principles of Operations Research: Prentice Hall of India 2010