ACADEMIC REGULATIONS (R20)

COURSE STRUCTURE AND DETAILED SYLLABUS

(CHOICE BASED CREDIT SYSTEM (CBCS))

MASTER OF TECHNOLOGY
IN
STRUCTURAL ENGINEERING

For

M. Tech. - Regular Two Year Post Graduate Degree Programme

(Applicable for the batches admitted from 2020 - 2021)

CMR INSTITUTE OF TECHNOLOGY

(UGC - Autonomous)

Approved by AICTE, Permanently Affiliated to JNTUH, Accredited by NAAC with A Grade and NBA

Kandlakoya(V), Medchal District, Hyderabad-501 401, Telangana State

Landline: 08418-200720; Fax: 08418-200240

E-mail: principal@cmritonline.ac.in Web: www.cmritonline.ac.in

FOREWORD

CMR Institute of Technology, established in the year 2005, Approved by AICTE, New Delhi, Permanently Affiliated to JNTUH, twice Accredited by NBA, Achieved UGC Autonomous Status and has been bestowed with NAAC 'A' Grade in July 2018 for its remarkable academic accomplishments accompanied by its unflinching spirit and dedication to impart quality technical education to the deserving aspirants. The institution has commenced functioning independently within the set norms prescribed by UGC and AICTE. The performance of the institution manifests the confidence that the prestigious monitoring body, the UGC has on it, in terms of upholding its spirit and sustenance of the expected standards of functioning on its own consequently facilitating the award of degrees for its students. Thus, an autonomous institution is provided with the necessary freedom to have its own **curriculum, examination system and monitoring mechanism**, independent of the affiliating University but under its observance.

CMR Institute of Technology takes pride for having won the confidence of such distinguished academic bodies meant for monitoring the quality in technology education. Besides, the institution is delighted to sustain the same spirit of discharging the responsibilities that it has been conveying since a decade to attain the current academic excellence, if not improving upon the standards and ethics. Consequently, statutory bodies such as the Academic Council and the Boards of Studies have been constituted under the supervision of the Governing Body of the College and with the recommendations of the JNTU Hyderabad, to frame the regulations, course structure and syllabi for autonomous status.

The autonomous regulations, course structure and syllabi have been framed in accordance with the vision and mission of the institution along with certain valuable suggestions from professionals of various ancillary fields such as the academics, the industry and the research, all with a noble vision to impart quality technical education and contribute in catering full-fledged engineering and management graduates to the society.

All the faculty members, the parents and the students are requested to study all the rules and regulations carefully and approach the Principal to seek any clarifications, if needed, without presumptions, to avoid unwanted subsequent inconveniences and embarrassments. The cooperation of all the stake holders is sought for the successful implementation of the autonomous system in the larger interests of the institution and for brightening the career prospects of engineering and management graduates.

CMR INSTITUTE OF TECHNOLOGY

Vision: To create world class technocrats for societal needs.

Mission: Impart global quality technical education for a better future by providing appropriate learning environment through continuous improvement and customization.

Quality Policy: Strive for global excellence in academics & research to the satisfaction of students and stakeholders.

Department of Civil Engineering (CE)

Vision: To be a centre of excellence that nurtures technically competent civil engineers and promotes high-end research to meet the global challenges.

Mission: Provide fundamentals and emerging technical skills to design, build, operate and manage the infrastructure requirements of the society through education, training, research and consultancy.

M.Tech. - Regular Two Year Post Graduate Degree Programme

(For batches admitted from the academic year 2020 - 21)

PREAMBLE

For pursuing M.Tech. - Regular Two Year Post Graduate Degree Programme offered by **CMR Institute of Technology (CMRIT)** under Autonomous status will herein be referred to as CMRIT (Autonomous).

All the specified rules are herein approved by the Academic Council. These rules will be in force and are applicable to students admitted from the academic year 2020-21 onwards. Any reference to "**Institute**" or "**College**" in these rules and regulations stand for CMRIT (Autonomous).

All the rules and regulations specified shall hereafter be read as a whole for the purpose of interpretation, as and when a doubt arises, the interpretation of the Chairman, Academic Council is final. As per the requirements of statutory bodies, the Principal, CMRIT (Autonomous) shall be The Chairman, Academic Council.

1. POST GRADUATE PROGRAMS OFFERED

CMR Institute of Technology, an autonomous college affiliated to JNTUH, offers M.Tech. - Regular 2 years (4 semesters) Post Graduate Degree Programme, under Choice Based Credit System (CBCS) and Credit Based Semester System (CBSS) are taken as 'references' for the present set of Regulations with effect from the academic year 2020 - 21 onwards. The following specializations are offered at present for the M. Tech. programme of study.

Sl. No.	Programme	Offering Department
1	Structural Engineering	Civil Engineering
2	CAD/CAM	Mechanical Engineering
3	VLSI System Design	Electronics & Communication Engineering
4	Computer Science and Engineering	Computer Science and Engineering

2. ADMISSION CRITERIA AND MEDIUM OF INSTRUCTION

2.1. Admission into first year of M.Tech. - Regular Two Year Post Graduate Degree Programme

2.1.1 Eligibility: A candidate seeking admission into the first year of M.Tech. shall be made subject to eligibility and qualification as prescribed by the university from time to time. Admissions shall be made on the basis of merit/rank obtained by the candidate qualified at TSPGECET/GATE or any entrance test conducted by the university or on the basis of any other order of merit as approved by the university, subject to reservations as laid down from time to time by government of Telangana.

2.1.2 Admission Procedure: Admissions are made into the first year M.Tech. as per the stipulations of the TSPGECET/GATE.

(a) Category A: 70% seats are filled through TSPGECET/GATE counseling.
(b) Category B: 30% seats are filled by the management.

2.2. College Transfers: There shall be no college transfers after the completion of admission process.

2.3. Medium of Instruction: The medium of instruction and examinations for the entire M.Tech. - Programme will be in **English** only.

3. M.Tech. PROGRAMME (PGP in E&T) STRUCTURE

3.1 Admitted under M.Tech. (PGP in E&T) - Regular Two Year Post Graduate Degree Programme:

3.1.1 A student after securing admission shall pursue the post graduate programme in M.Tech. Programme for a minimum period of two academic years (4 semesters), and a maximum period of four academic years (8 semesters) starting from the date of commencement of first year first semester, failing which he/she shall forfeit his/her seat in M.Tech. Programme.

3.1.2 I Year is structured to provide typically 18 Credits in each of the I and II Semesters, and II Year 16 credits in each of the III & IV semesters, totaling to 68 Credits for the entire M.Tech. Programme.

3.1.3 Each student shall secure 68 credits (with CGPA ≥ 5) required for the completion of the post graduate programme and award of the M.Tech. Degree.

3.2 **UGC/AICTE** specified definitions / descriptions are adopted appropriately for various terms and abbreviations used in these academic regulations/ norms, which are listed below.

3.2.1 Semester Scheme:

M.Tech. (Regular) Programme is of 2 academic years (4 semesters) with the each academic year being divided into two semesters. Each Semester shall be of 22 weeks duration (inclusive of Examinations), with a minimum of 90 instructional days per Semester and shall have 'Continuous Internal Evaluation (CIE)' and 'Semester End Examination (SEE)', Choice Based Credit System (CBCS) and Credit Based Semester System (CBSS) as indicated by UGC and curriculum/course structure as suggested by AICTE / JNTUH. The terms 'SUBJECT' and 'COURSE' imply the same meaning here and refer to 'Theory Subject', or 'Lab Course', or 'Design / Drawing Subject', or 'Mini Project with Seminar', or 'Dissertation', as the case may be.

3.2.2 Credit Courses:

a) All subjects/courses are to be registered by a student in a semester to earn credits. Credits shall be assigned to each subject/course in a L: T: P: C (Lecture Periods: Tutorial Periods: Practical Periods: Credits) structure, based on the following general pattern.

Theory		Practical	
1 Hr. Lecture (L) per week	1 credit	1 Hr. Practical (P) per week	0.5 credit
1 Hr. Tutorial (T) per week	1 credit	2 Hrs Practical (Lab) per week	1.0 credit

All Mandatory Courses, Study Tour, Guest Lecture, etc., will not carry any Credits.

3.2.3 Subject/ Course Classification:

The College has followed the guidelines issued by AICTE/UGC. All Subjects/Courses offered for the PGP in E&T are broadly classified as Program Core, Program Elective, Open Elective, Audit Course, Minor Course and Mini Project with Seminar, Industrial Training and Dissertation.

3.2.4 Course Nomenclature:

The Curriculum Nomenclature or Course-Structure Grouping for the M.Tech. Degree Programmes is as listed below:

S. No.	*Broad Course Classification*	*Course Group/ Category*	*Courses Description*
	Core Courses (CoC)	PC- Program Core	Includes core subjects related to the Parent Discipline/ Department/ Branch of Engineering.
		Dissertation	M.Tech. Project or PG Project or PG Major Project
		Mini Project with Seminar	Seminar based on core contents related to parent discipline/department/branch of Engineering
		Minor Courses	1 or 2 Credit courses
		Audit Courses	Mandatory courses (non credit)
	Elective Courses (EℓC)	PE– Program Electives	Includes Elective subjects related to the Parent Discipline/ Department/ Branch of Engineering.
		OE-Open Electives	Elective subjects which include inter-disciplinary subjects in an area outside the parent discipline/ department/ branch of Engineering

* **Students are encouraged to go to Industrial Training/Internship for at least 4 - 6 weeks during semester break.**

4. COURSE REGISTRATION

4.1 A **'Faculty Advisor or Counselor'** shall be assigned to each student, who advises the student about the M.Tech. Programme, its course structure and curriculum, choice / option for subjects / courses, based on his/her competence, progress, pre-requisites and interest of the students.

4.2 A Student may be permitted to Register for Subjects / Courses of 'his/her CHOICE' with a typical total of 18 Credits per Semester in I Year (Minimum being 15 Credits and Maximum being 21 Credits, permitted deviation being ±15%), and 16 Credits (inclusive of Project) per III Semester in II Year (Minimum being 14 Credits and Maximum being 21 Credits), 16 credits (inclusive of Project) per IV Semester in II Year (minimum being 16 Credits and maximum 21 Credits), based on his interest, competence, progress, and 'Pre-Requisites' as indicated for various Subjects/ Courses, in the Department Course Structure (for the relevant Specialization) and Syllabus contents for various Subjects/ Courses.

4.3 Choice for 'additional Subjects / Courses' in any Semester (above the typical 18/16 Credit norm, and within the Maximum Permissible Limit of 21/21 Credits, during I/ II Years as applicable) must be clearly indicated in the Registration, which needs the specific approval and signature of the Faculty Advisor/ Counselor on hard-copy.

4.4 Dropping of Subjects/ Courses in any Semester of I Year may be permitted, ONLY AFTER obtaining prior approval and signature from the Faculty Advisor (subject to retaining a minimum of 15 Credits), 'within 15 Days of Time' from the beginning of the current Semester.

4.5 **Core Electives**: Students have to choose five core electives as per the course structure.

4.6 **Open Electives**: Students have to choose open elective other than parent department as per the course structure.

4.7 **Project work registration:** The Project shall start immediately after the completion of I year II semester. Every Student must compulsorily register for his/her M.Tech. Project Work. The student registered for the Project work shall work for two semesters.

5. ATTENDANCE REQUIREMENTS

The programmes are offered based on a unit system with each subject being considered a unit. Attendance is calculated separately for each subject.

5.1 Attendance in all classes (Lectures / Laboratories) is compulsory. The minimum required attendance in each theory subject (***also mandatory (audit) courses***) excluding the attendance of mid-term examination is 75%. A student shall not be permitted to appear for the Semester End Examinations (SEE), if his attendance is less than 75%.

5.2 A student's Seminar report and presentation on Mini Project shall be eligible for evaluation, only if he ensures a minimum of 75% of his attendance in Seminar presentation classes on Mini Project during that Semester.

5.3 **Condoning of shortage of attendance** (between 65% and 75%) up to a maximum of 10% (considering the days of attendance in sports, games, NCC, NSS activities and Medical grounds) in each subject (Theory / Lab / Mini Project with Seminar) of a semester shall be granted by the College Academic Committee on genuine reasons.

5.4 A prescribed fee per subject shall be payable for condoning shortage of attendance after getting the approval of College Academic Committee for the same. The College Academic Committee shall maintain relevant documents along with the request from the student.

5.5 Shortage of Attendance below 65% in any subject shall in **no case be condoned.**

5.6 A Student, whose shortage of attendance is not condoned in any Subject(s) (Theory / Lab / Mini Project with Seminar) in any Semester, is considered as 'Detained in that Subject(s), and is not eligible to write Semester End Examination(s) of such Subject(s), (in case of Mini Project with Seminar, his/her Mini Project with Seminar Report or Presentation are not eligible for evaluation) in that Semester; and he/she has to seek re-registration for those Subject(s) in subsequent Semesters, and attend the same as and when offered.

5.7 A student fulfills the attendance requirement in the present semester, shall not be eligible for readmission into the same class.

5.8 **a)** A student shall put in a minimum required attendance in at least **three theory subjects (excluding *mandatory (audit)* course)** in first Year I semester for promotion to first Year II Semester.

b) A student shall put in a minimum required attendance in at least **three theory subjects (excluding *mandatory (audit)* course)** in first Year II semester for promotion to second Year I Semester.

6. ACADEMIC REQUIREMENTS

The following academic requirements have to be satisfied, in addition to the attendance requirements mentioned in item no. 5.

6.1 A Student shall be deemed to have satisfied the Academic Requirements and earned the Credits allotted to each Subject/ Course, if he secures not less than 40% Marks (28 out of 70 Marks) in the End Semester Examination, and a minimum of 50% of Marks in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together; in terms of Letter Grades, this implies securing B Grade or above in that Subject.

6.2 A Student shall be deemed to have satisfied the academic requirements and earned the Credits allotted to - Mini Project with Seminar, if student secures not less than 50% of the total Marks to be awarded. The Student would be treated as failed, if the student -

(i) does not present the Mini Project with Seminar as required, or
(ii) Secures less than 50% of Marks (< 50 Marks) in Mini Project with Seminar.

6.3 A Student shall - register for all Subjects covering 68 Credits as specified and listed in the Course Structure for the chosen PGP Specialization, put up all the Attendance and Academic requirements for securing 68 Credits obtaining a minimum of B Grade or above in each Subject and 'earn all 68 Credits securing Semester Grade Point Average (SGPA) ≥ 6.0 (in each Semester) and final Cumulative Grade Point Average (CGPA) (i.e., CGPA at the end of PGP) ≥ 6.0, to successfully complete the PGP.

Note: (1) The SGPA will be computed and printed on the marks memo only if the student passes in all the subjects offered and gets minimum B grade in all the subjects.

(2) CGPA is calculated only when the student passes in all the subjects offered in all the semesters.

6.4 Marks and Letter Grades obtained in all those Subjects covering the above specified 68 Credits alone shall be considered for the calculation of final CGPA, which shall be indicated in the Grade Card / Marks Memo of II Year II Semester.

6.5 If a student registers for some more 'extra Subjects' (in the parent Department or other Departments/Branches of Engineering.) other than those listed Subjects totaling to 68 Credits as specified in the Course Structure, the performances in those 'extra Subjects' (although evaluated and graded using the same procedure as that of the required 68 Credits) will not be taken into account while calculating the SGPA and CGPA. For such 'extra Subjects' registered, % marks and Letter Grade alone will be indicated in the Grade Card, as a performance measure, subject to completion of the Attendance and Academic Requirements as stated in Items 5 and 6.1 – 6.4 above.

6.6 Students who fail to earn 68 Credits as per the specified Course Structure, and as indicated above, within 4 Academic Years from the date of Commencement of their I Year, shall forfeit their seats in M.Tech. Programme and their admissions shall stand cancelled.

6.7 When a student is detained due to shortage of attendance in any subject(s)/seminar in any semester, no Grade Allotment will be done for such Subject(s)/Seminar, and SGPA/ CGPA calculations of that Semester will not include the performance evaluations of such subject(s)/seminar in which he got detained. However, he becomes eligible for re-registration of such subject(s)/seminar (in which he got detained) in the subsequent Semester(s), as and when next offered, with the Academic Regulations of the Batch into which he gets readmitted, by paying the stipulated fees per subject. In all these re-registration cases, the student shall have to secure a fresh set of Internal Marks (CIE) and End Semester Examination Marks (SEE) for performance evaluation in such subject(s), and subsequent SGPA/ CGPA calculations.

6.8 A student eligible to appear in the Semester End Examination (SEE) in any subject, but absent at it or failed (failing to secure B Grade or above), may reappear for that subject at the supplementary examination (SEE) as and when conducted. In such cases, his Internal Marks (CIE) assessed earlier for that Subject/ Course will be carried over, and added to the marks to be obtained in the supplementary examination (SEE), for evaluating his performance in that Subject.

7. EVALUATION - DISTRIBUTION AND WEIGHTAGE OF MARKS

7.1 The performance of a Student in each Semester shall be evaluated Subject-wise (irrespective of Credits assigned) with a maximum of 100 Marks for Theory or Practical's or Mini Project with Seminar or Drawing/Design etc; however, the M.Tech. Project Work (Major Project) will be evaluated by the external examiner for 100 Marks.

7.2 **a)** For Theory Subjects (inclusive of Minor Courses), during the Semester, there shall be 2 mid-term examinations for 25 marks (with duration of 120 minutes). Further, there will be an allocation of 5 marks for Assignment.

b) The first mid-term examination shall be conducted for the first 50% of the syllabus, and the second mid-term examination shall be conducted for the remaining 50% of the syllabus.

c) First Assignment should be submitted before the conduct of the first mid-term examinations, and the Second Assignment should be submitted before the conduct of the second mid-term examinations. The Assignments shall be as specified by the concerned subject teacher.

d) The first mid-term examination Marks and first Assignment Marks shall make one set of CIE Marks, and the second mid-term examination Marks and second Assignment Marks shall make second set of CIE Marks. The final CIE marks (for total of 30) are the better of these two mid-term examinations in each subject.

7.3 For Practical Subjects, there shall be a Continuous Internal Evaluation (CIE) during the Semester for 30 Internal Marks, and 70 Marks are assigned for Lab/Practical's Semester End Examination (SEE). Out of the 30 Marks for Internals, day-to-day work assessment in the laboratory shall be evaluated for 20 Marks; and the performance in an internal Lab/Practical Test shall be evaluated for 10 marks, there shall be two internal Lab/Practical Test in a semester and the better of these two shall be taken as final marks. The SEE for Lab / Practical's shall be conducted at the end of the Semester by the concerned Lab teacher and external examiner appointed by the Head of the Institution.

7.4 For mandatory (audit) courses, a student has to secure 40 marks out of 100 marks (i.e. 40% of the marks allotted) in the continuous internal evaluation for passing the subject/course. No marks or letter grades shall be allotted for mandatory (audit) courses. Only Pass/Fail shall be indicated in Grade Card.

7.5 There shall be a Mini Project with Seminar presentation in I Year II Semester for 100 marks, for which the student shall collect the information on a specialized topic, prepare a Mini Project Report and submit to the department. The Continuous Internal Evaluation (CIE) of 30 Marks evaluated by the guide / supervisor and Semester End Examination (SEE) of 70 marks evaluated by the committee. The evaluation committee consisting of Head of the Department, Mini Project Guide and senior faculty as appointed by Head of the Department.

7.6 Guidelines for Project Work Evaluation:

a) The Project shall start immediately after the completion of I year II semester. Every Student must register for his M.Tech. Project Work, within the 4 weeks after the completion of I year II Semester. The student registered for the Project work shall work for two semesters. After Registration and in consultation with the guide, the Student has to present the title, objective and plan of action of his project work to the Project Review Committee (PRC) for approval within 6 weeks after the completion of I year II Semester. Only after obtaining the approval of the PRC, the student can initiate the Project work.

b) A Project Review Committee (PRC) shall be constituted by Head of the Department and shall consist of the Head of the Department (Chairperson) Project Guide and one senior faculty member of the Department.

c) If a student wishes to change his Guide or topic of the project, he can do so with the approval of the PRC. However, the PRC shall examine whether or not the change of topic/Guide leads to a major change of his initial plans of project proposal. If yes, his date of registration for the project work starts from the date of change of Guide or topic as the case may be.

7.7 Monitoring of Project work progress by PRC

a) The PRC will monitor the progress of the Project Work of the student. Project work Review-I will be held at the end of the III Semester (II Year I Semester) and Project work Review- II will be held at the end of the IV Semester (II year II Semester) before the submission of Project Report/ Dissertation.

b) **The Project Work Review-I:** There shall be a Dissertation-I/Industrial Project-I during the III Semester (II Year I Semester). The Dissertation-I/Industrial Project-I shall be evaluated by the project external viva-voce examination committee for 70 Marks (which will be considered as SEE). The student has to get a minimum of 40% marks (28 marks out of 70 marks) for successful completion. Project guide and PRC-I shall evaluate for 30 marks (which will be considered as CIE). The guide evaluates for 15 marks and PRC-I evaluates for rest of 15 marks. The student has to secure a minimum of 50 marks (CIE + SEE) out of 100 marks to be declared successful. If the student fails to obtain the minimum marks, the student has to reappear for the Dissertation-I/Industrial Project-I during the supplementary examinations. The student shall be permitted to register Dissertation-II/Industrial Project-II only after successful completion of Dissertation-I/Industrial Project-I.

c) **The Project Work Review-II:** There shall be a Dissertation-II/Industrial Project-II during the IV Semester (II Year II Semester). The Dissertation-II/Industrial Project-II shall be evaluated by the project external viva-voce examination committee for 70 Marks (which will be considered as SEE). The student has to get a minimum of 40% marks (28 marks out of 70 marks) for successful completion. Project guide and PRC-II shall evaluate for 30 marks (which will be considered as CIE). The guide evaluates for 15 marks and PRC-II evaluates for rest of 15 marks. The student has to secure a minimum of 50 marks (CIE + SEE) out of 100 marks to be declared successful. If the student fails to obtain the minimum marks, the student has to reappear for the Dissertation-II/Industrial Project-II during the supplementary examinations.

d) To satisfy item (c), the student has to submit a soft copy of the final consolidated report of Dissertation - I & II / Industrial Project – I & II to the Head of the Department for 'ANTIPLAGIARISM' check. The Head of the Department should carry out plagiarism check and submit the report to the Principal. The Dissertation will be accepted for submission, only if the similarity index is less than 30%. If the similarity index has more than the required percentage, the student is advised to modify accordingly and re-submit the soft copy of the Dissertation only after one month. Only after submission of a hard copy of final project report in 4 copies along with plagiarism report, the Dissertation-II / Industrial Project-II shall be evaluated by the project external viva-voce examination committee. The maximum number of re-submissions of Dissertation after plagiarism check is limited to TWO.

e) The candidate has to register for the project and work for two semesters (not less than 44 weeks including registration and approval of Project-I and Project-II). After three attempts (including regular attempt), the admission is liable to be cancelled. The college authorities are advised to make plagiarism check of every soft copy of theses before submissions.

f) The Student shall be allowed to submit his Project Dissertation, only on the successful completion of all the prescribed PG Subjects (Theory and Practical's.), Mini Project with Seminar, etc. (securing B Grade or above), and after obtaining all approvals from PRC.

g) Three copies of the Dissertation Thesis certified by the supervisor shall be submitted to the College/School/Institute, after submission of a research paper related to the Dissertation work in a reputed journal / conference. A copy of the submitted research paper shall be attached to thesis.

h) The Dissertation of the student will be evaluated by the committee along with external examiner (appointed by the Head of the Institution) based on his/her presentation followed by viva-voce examination.

i) If the report of the committee is unsatisfactory, the student shall revise and resubmit the project after ONE semester, or as per the time specified by the committee. If the resubmitted report is also unsatisfactory, then the Dissertation shall be rejected summarily. No further correspondence in this matter will be entertained, if there is no specific recommendation for resubmission by the committee.

j) If the student's oral presentation is not satisfactory, the committee may defer it and the student has to re-appear for the oral presentation before the same committee for the award of degree.

k) The Committee should submit Project External examination marks to the Head of the Institution on the day of the examination.

8. Re-Admission / Re-Registration:

8.1. **Re-Admission for Discontinued Students:** Students, who have discontinued the M.Tech. Degree Programme due to any reasons whatsoever, may be considered for 'Readmission' into the same Degree Programme (with same specialization) with the Academic Regulations of the Batch into which he gets Re-admitted, with prior permission from the concerned authorities, subject to Item 3.1.

8.2. **Re-Registration for Detained Students:** When any Student is detained in a Subject (Theory / Practical / Seminar etc.) due to shortage of attendance in any Semester, he may be permitted to re-register for the same Subject in the 'same category' (Core or Elective Group) or equivalent Subject if the same Subject is not available, as suggested by the Board of Studies of that Department, as when offered in the sub-sequent Semester(s), with the Academic Regulations of the Batch into which he seeks re-registration , with prior permission from the concerned authorities, subject to Item 3.1.

9. GRADING PROCEDURE

9.1 Marks will be awarded to indicate the performance of each student in each Theory Subject, or Practical, or Mini Project with Seminar, Project, etc., based on the % marks obtained in CIE + SEE (Continuous Internal Evaluation + Semester End Examination, both taken together) as specified in Item 6 above, and a corresponding Letter Grade shall be given.

9.2 As a measure of the student's performance, a 10-point Absolute Grading System using the following Letter Grades (UGC Guidelines) and corresponding percentage of marks shall be followed:

% of Marks Secured (Class Intervals)	Letter Grade	Grade Points
90% and above	O (Outstanding)	10
Below 90% but not less than 80%	A^+ (Excellent)	9
Below 80% but not less than 70%	A (Very Good)	8
Below 70% but not less than 60%	B^+ (Good)	7
Below 60% but not less than 50%	B (Above Average)	6
Below 50% (< 50%)	F (Fail)	0
Absent	**Ab**	**0**

9.3 A student obtaining F Grade in any Subject shall be considered 'failed' and is be required to reappear as 'Supplementary Student' in the Semester End Examination (SEE), as and when conduct. In such cases, his Internal Marks (CIE Marks) in those Subjects will remain the same as those he obtained earlier.

9.4 If a student not appear for the examinations, 'Absent' Grade will be allocated to him for any subject and shall be considered 'failed' and will be required to reappear as 'Supplementary

Student' for the Semester End Examination (SEE), as and when conducted.

9.5 A Letter Grade does not imply any specific % of marks.

9.6 In general, a student shall not be permitted to repeat any subject / course (s) only for the sake of 'Grade Improvement' or 'SGPA/CGPA Improvement.

9.7 A student earns Grade Point (GP) in each Subject/ Course, on the basis of the Letter Grade obtained by him in that Subject/ Course (excluding Audit non-credit Courses). Then the corresponding 'Credit Points' (CP) are computed by multiplying the Grade Point with Credits for that particular Subject/ Course.

Credit Points (CP) = Grade Point (GP) x Credits … For a Course

9.8 The Student passes the subject/course only when he gets GP ≥ 6 (B Grade or above).

9.9 The Semester Grade Point Average (SGPA) is calculated by dividing the sum of credit points (ΣCP) secured from all subjects / courses registered in a semester, by the total number of credits registered during that semester. SGPA is rounded off to **two** decimal places. SGPA is thus computed as

$$\textbf{SGPA } (S_i) = \sum (C_i \times G_i) / \sum C_i$$

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

9.10 The Cumulative Grade Point Average (CGPA) is a measure of the overall cumulative performance of a student in all semesters considered for registration. The CGPA is the ratio of the total credit points secured by a student in **all** registered courses in **all** Semesters, and the total number of credits registered in **all** the semesters. CGPA is rounded off to **two** decimal places. CGPA is thus computed from the I year second semester onwards, at the end of each semester, as per the formula:

$$\textbf{CGPA} = \sum (C_i \times S_i) / \sum C_i$$

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

Illustration of calculation of SGPA					Illustration of calculation of CGPA			
Course /Subject	Credits	Letter Grade	Grade Points	Credit Points	Semester	Credits	SGPA	Credits x SGPA
Course 1	3	A	8	24	Sem I	18	7.00	126
Course 2	3	O	10	30	Sem II	18	6.00	108
Course 3	4	B^+	7	28	Sem III	16	6.50	104
Course 4	3	B	6	18	Sem IV	16	8.00	128
Course 5	2	A^+	9	18				
Course 6	1.5	B	6	09				
Course 7	1.5	O	10	15				
Total	18			142	Total	68		426
SGPA = 142/18 = 7.89					**CGPA** =466/68 = 6.85			

9.11 For merit ranking or comparison purposes or any other listing, **only** the '**rounded off**' values of the CGPAs will be used.

9.12 For calculations listed in item 9.7 to 9.11, performance in failed subjects/courses (securing '**F**' grade) will also be taken into account, and the credits of such subjects/courses will also be included in the multiplications and summations.

10. DECLARATION OF RESULTS

10.1 Computation of SGPA and CGPA are done using the procedure in item Nos. 9.6 to 9.9.

10.2 For final percentage of marks equivalent to the computed final CGPA, the following formula may be used:

Percentage of Marks = (final CGPA – 0.5) x 10

11 AWARD OF DEGREE

11.1 After a student has satisfied the requirement 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 four classes based on CGPA:

Class Awarded	CGPA	Remarks
First Class with Distinction	≥ 7.75	From the aggregate marks secured from 68 credits for regular students
First Class	6.75≤ CGPA < 7.75	
Second Class	6.00≤ CGPA < 6.75	

A student with final CGPA (at the end of the **PGP) < 6.00** shall not be eligible for the Award of Degree.

11.2 First Class with Distinction will be awarded to those students who clear all the subjects in single attempt during his/her regular course of study by fulfilling the following conditions:

11.2.1 Should have passed all the subjects/courses in '**first appearance'** within the first 2 academic years (or 4 sequential semesters) for M.Tech.

11.2.2 Should have secured a CGPA ≥7.75, at the end of each of the 4 sequential semesters.

11.2.3 Should not have been detained or prevented from writing the Semester End Examinations in any semester due to shortage of attendance or any other reason, shall be placed in '**First Class with Distinction'**.

11.3 Award of Medals: Students fulfilling the conditions listed under item 11.2 alone will be eligible for award of **'College ranks'** and **'Medals'**.

11.4 Transcripts: After successful completion of prerequisite credits for the award of degree a transcript containing performance of all academic years will be issued as a final record. Duplicate transcripts will also be issued if required after the payment of requisite fee and also as per norms in vogue.

12 WITH HOLDING OF RESULTS

If the student has not paid the fee to college at any stage, or has dues pending against his/her name due to any reason what so ever, or if any case of indiscipline is pending against him/her, the result of the student may be withheld, and he/she will not be allowed to go into the next higher semester. The award or issue of the degree may also be withheld in such cases.

13 SUPPLEMENTARY EXAMINATIONS

Supplementary examinations for odd semester subject(s) / course (s) shall be conducted along with even semester regular examinations and vice versa.

14. TRANSITORY REGULATIONS

A Student - who has discontinued for any reason, or who has been detained for want of attendance as specified, or who has failed after having undergone PGP, may be considered

eligible for readmission to the same PGP with same set of Subjects/ Courses (or equivalent Subjects/ Courses as the case may be), and same Professional Electives (or from same set/category of Electives or equivalents as suggested), as and when they are offered (within the time-frame of 4 years from the Date of Commencement of his I Year I Semester).

15. STUDENT TRANSFERS

There shall be no transfers from other colleges/streams.

16 RULES OF DISCIPLINE

16.1 Any attempt by any student to influence the teachers, Examiners, faculty and staff of controller of Examination for undue favours in the exams, and bribing them either for marks or attendance will be treated as malpractice cases and the student can be debarred from the college.

16.2 When the student absents himself, he is treated as to have appeared and obtained zero marks in that subject(s) and grading is done accordingly.

16.3 When the performance of the student in any subject(s) is cancelled as a punishment for indiscipline, he is awarded zero marks in that subject(s).

16.4 When the student's answer book is confiscated for any kind of attempted or suspected malpractice the decision of the Examiner is final.

17. MALPRACTICE

17.1 **Malpractice Prevention Committee:** The committee shall examine the student's malpractice and indiscipline cases occurred, while conducting the examinations and recommend appropriate punishment to the Academic Council after taking explanation from the student and concerned invigilator as per the malpractice rules mentioned below. The committee consists of

a) Controller of Examinations - Chairman
b) Addl. Controller of Examinations.- Convener
c) Subject Expert - Member
d) Head of the Department of which the student belongs to - Member
e) The Invigilator concerned - Member

17.2 **Malpractice Rules:** Disciplinary action for improper conduct in examinations

S. No.	Nature of Malpractices / Improper Conduct	Punishment
1(a)	Possesses or keeps accessible in examination hall, any paper, note book, 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.

1(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 Principal.
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 and forfeits the 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 two consecutive semesters from class work and all 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 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.
6	Refuses to obey the orders of the Addl. Controller of examinations / any officer on duty or misbehaves or	In case of students of the college, they shall be expelled from examination halls and cancellation of their performance in that

	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 addl. Controller of examinations 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 addl. Controller of examinations, 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 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.	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. The candidates also are debarred and forfeit their seats. In case of outsiders, they will be handed over to the police and a police case is registered against them.
7	Leaves the exam hall taking away answer script or intentionally tears of the script or any part thereof 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 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 and all other subjects the candidate has appeared including practical examinations and project work of that semester/year examinations.
12	If any malpractice is detected which is not covered in the above clauses 1 to 11 shall be reported to the principal for further action to award suitable punishment.	

18. SCOPE

i) The academic regulations should be read as a whole, for the purpose of any interpretation.

ii) The above mentioned rules and regulations are applicable in general to M.Tech., unless and otherwise specific.

iii) In case of any doubt or ambiguity in the interpretation of the above rules, the decision of the Chairman of the Academic Council is final.

19. REVISION AND AMENDMENTS TO REGULATIONS

The Academic Council may revise or amend the academic regulations, course structure or syllabi at any time, and the changes or amendments made shall be applicable to all students with effect from the dates notified by the Academic Council Authorities.

———

COURSE STRUCTURE

M.Tech. (Structural Engineering) – R20 COURSE STRUCTURE

(Applicable from the batch admitted during 2020-21 and onwards)

I – Semester									
S. No	Course Code	Subject	Hours Per Week			Credits	Scheme of Evaluation		
							Maximum Marks		
			L	T	P		Int.	Ext.	Tot.
1	20SEPC101	Advanced Concrete Technology	3	0	0	3	30	70	100
2	20SEPC102	Theory of Elasticity	3	0	0	3	30	70	100
3	**Professional Elective-1:**		3	0	0	3	30	70	100
	20SEPE101	Advanced Reinforced Concrete Design							
	20SEPE102	Theory and Applications of Cement Composites							
	20SEPE103	Theory of Structural Stability							
4	**Professional Elective-2 :**		3	0	0	3	30	70	100
	20SEPE104	Numerical Methods in Structural Engineering							
	20SEPE105	Structural Health Monitoring							
	20SEPE106	Structural Optimization							
5	20SEPC103	Advanced Concrete Technology Lab-I	0	0	4	2	30	70	100
6	20SEPC104	Numerical Analysis Lab	0	0	4	2	30	70	100
7	20MC101	Research Methodology and IPR	2	0	0	2	30	70	100
8	**Audit Course -1**		2	0	0	0	100	-	100
	20AC101	English for Research Paper Writing							
	20AC102	Value Education							
	20AC103	Constitution of India							
TOTAL			**16**	**0**	**8**	**18**	**310**	**490**	**800**

II – Semester									
S. No.	Course Code	Subject	Hours Per Week			Credits	Scheme of Evaluation		
							Maximum Marks		
			L	T	P		Int.	Ext.	Tot.
1	20SEPC201	FEM in Structural Engineering	3	0	0	3	30	70	100
2	20SEPC202	Structural Dynamics	3	0	0	3	30	70	100
3	**Professional Elective -3**		3	0	0	3	30	70	100
	20SEPE201	Advanced Steel Design							
	20SEPE202	Design of Formwork							
	20SEPE203	Design of Masonry Structures							
4	**Professional Elective -4**		3	0	0	3	30	70	100
	20SEPE204	Theory of Thin Plates & Shells							
	20SEPE205	Advanced Design of Foundations							
	20SEPE206	Design of Industrial Structures							
5	20SEPC203	Structural Design Lab	0	0	4	2	30	70	100
6	20SEPC204	Advanced Concrete Technology Lab-II	0	0	4	2	30	70	100
7	20SEPR201	Mini Project with Seminar	0	0	4	2	30	70	100
8	**Audit Course -2**		2	0	0	0	100	-	100
	20AC201	Pedagogy Studies							
	20AC202	Stress Management by yoga							
	20AC203	Personality Development through Life Enlightenment Skills							
TOTAL			**14**	**0**	**12**	**18**	**310**	**490**	**800**

III – Semester									
S. No	Course Code	Subject	Hours Per Week			Credits	Scheme of Evaluation		
							Maximum Marks		
			L	T	P		Int.	Ext.	Tot.
1	**Professional Elective -5**		3	0	0	3	30	70	100
	20SEPE301	Earthquake Resistance Design of Buildings							
	20SEPE302	Design of Prestressed Concrete Structures							
	20SEPE303	Advanced Structural Analysis							
2	**Open Elective**		3	0	0	3	30	70	100
	20MEOE301	Composite Materials							
	20CEOE302	Construction Management							
	20ECOE303	VLSI Design							
	20CSOE304	Data Mining and Analytics							
3	20SEPR301	Project – I / Dissertation Phase -I	0	0	20	10	30	70	100
TOTAL			**6**	**0**	**20**	**16**	**90**	**210**	**300**

IV – Semester									
S. No.	Course Code	Subject	Hours Per Week			Credits	Scheme of Evaluation		
							Maximum Marks		
			L	T	P		Int.	Ext.	Tot.
1	20SEPR401	Project – II / Dissertation Phase -II	0	0	32	16	30	70	100
TOTAL			**0**	**0**	**32**	**16**	**30**	**70**	**100**

Total Credit for the Programme PG Credits: = 18+ 18+16+16 = 68

I-M.TECH.-I-SEMESTER SYLLABUS

ADVANCED CONCRETE TECHNOLOGY

	L	T	P	C
I-M.Tech.-I-Sem.				
Course Code: 20SEPC101	**3**	**0**	**0**	**3**

Prerequisites: Concrete Technology

Course Outcomes: Upon completion of the course, the students will be able to

1. explain various constituent of concrete and admixtures
2. discuss various tests in fresh and hardened concrete
3. design the high strength and high performance concrete
4. analyze the requirements and guidelines of special concrete
5. develop the form work systems

UNIT – I

Concrete Making Materials : Cement – Bogus Compounds – Hydration Process – Types of Cement – Aggregates – Gradation Charts – Combined Aggregate – Alakali Silica Reaction – Admixtures – Chemical and Mineral Admixtures. Bureau of Indian Standards (BIS) Provisions.

UNIT – II

Fresh And Hardened Concrete: Fresh Concrete – workability tests on Concrete – Setting Times of Fresh Concrete – Segregation and bleeding.

Hardened Concrete : Abrams Law, Gel space ratios, Maturity concept – Stress strain Behaviour – Creep and Shrinkage – Durability Tests on Concrete – Non Destructive Testing of Concrete. BIS Provisions.

UNIT – III

High Strength Concrete – Microstructure – Manufacturing and Properties – Design of HSC Using Erintroy Shaklok method – Ultra High Strength Concrete.

High Performance Concrete – Requirements and Properties of High Performance Concrete – Design Considerations. BIS Provisions.

UNIT – IV

Special Concretes : Self Compacting concrete, Polymer Concrete, Fibre Reinforced Concrete – Reactive Powder Concrete – Requirements and Guidelines – Advantages and Applications.

Concrete Mix Design: Quality Control – Quality Assurance – Quality Audit - Mix Design Method – BIS Method – DOE Method – Light Weight Concrete, Self Compacting Concrete.

UNIT – V

Form work – materials – structural requests – form work systems – connections – specifications – design of form work – shores – removal for forms - shores – reshoring – failure of form work.

REFERENCES

1. Properties of Concrete by A.M.Neville, ELBS publications.
2. Concrete: Micro Structure, Properties and Materials by P.K.Mehta and P.J.Monteiro,. Mc. Graw-Hill Publishing Company Ltd. New Delhi
3. Concrete Technology by M.S.Shetty, S.Chand & Co.
4. Concrete Technology by A.R. Santhakumar, Oxford University Press.
5. Design of Concrete Mixes by N.Krishna Raju, CBS Publications.

THEORY OF ELASTICITY

I-M.Tech.-I-Sem. **L T P C**
Course Code: 20SEPC102 **3 0 0 3**

Prerequisites: Strength of Materials I & II

Course Outcomes: Upon completion of the course, the students will be able to

1. develop the differential equations of equilibrium for 2D and 3D
2. discuss the application of plane stress and plane strain in Flexural member
3. apply two dimensional for torsion in circular and non-circular cross-sections
4. explain the three dimensional Analysis for Principle stresses and principle Strain
5. analysis of Torsion for Prismatic bars and shaft

UNIT-I

Introduction: Elasticity - notation for forces and stress - components of stresses - components of strain - Hooks law. Plane stress and plane strain analysis - differential equations of equilibrium 2D & 3D - boundary conditions – Strain Displacement Relations - compatibility equations – stress tensor and strain tensor.

UNIT-II

Two dimensional problems in rectangular coordinates - solution by polynomials - Saint-Venants principle - determination of displacements - bending of simple beams stress function – Simply Supported and Cantilever Beams.

UNIT-III

Two dimensional problems in polar coordinates - stress distribution symmetrical about an axis - pure bending of curved bars - strain components in polar coordinates - displacements for symmetrical stress distributions Edge Dislocation - general solution of two-dimensional problem in polar coordinates - application to Plates with Circular Holes – Rotating Disk. Bending of Prismatic Bars: Stress function - bending of cantilever - circular cross section - elliptical cross section - rectangular cross section.

UNIT- IV

Analysis of stress and strain in three dimensions - principal stress - stress ellipsoid - director surface - determination of principal stresses Stress Invariants - max shear stresses - Homogeneous deformation - principal axes of strain-rotation. General Theorems: Differential equations of equilibrium - conditions of compatibility - determination of displacement - equations of equilibrium in terms of displacements - principle of super position - uniqueness of solution - the reciprocal theorem Strain Energy.

UNIT-V

Torsion of Circular Shafts - Torsion of Straight Prismatic Bars – Saint Venants Method - torsion of prismatic bars - bars with elliptical cross sections - membrane analogy - torsion of a bar of narrow rectangular bars - torsion of shafts, tubes , bars etc.

References .

1. Theory of Elasticity by Timeshenko, McGrawhill Publications
2. Theory of Elasticity by Y.C.Fung.
3. Theory of Elasticity by Gurucharan Singh.

ADVANCED REINFORCED CONCRETE DESIGN
(Professional Elective – 1)

I-M.Tech.-I-Sem. **L T P C**
Course Code: 20SEPE101 **3 0 0 3**

Prerequisites: Design of Reinforced Concrete Structures

Course Outcomes: Upon completion of the course, the students will be able to
1. summarize the basic concepts of reinforced concrete design
2. analyze rc elements by limit state and various method
3. design the flat and ribbed slab
4. design of deep beam and corbels
5. design of compression members and combined footings

UNIT-I
Basic Design Concepts: Behavior in flexure, Design of singly Reinforced rectangular sections, Design of Doubly Reinforced rectangular sections, Design of flanged bean sections, Design for shear – Design for Torsion**,** Limit state of Serviceability**:** Deflections of Reinforced concrete beams and slabs short term deflections and long term deflection estimation of crack width in RCC members, calculation of crack widths.

UNIT-II
Limit Analysis of R.C. Structures: Rotation of a plastic hinge, Redistribution of moments, moment rotation characteristics of RC member, I.S. code provisions, applications for fixed and continuous beam. Yield line analysis for slabs: Upper bound and lower bound theorems, yield line criterion, Virtual work and equilibrium methods of analysis,For square and circular slabs with simple and continuous end conditions. Moment Curvature diagram.

UNIT - III
Ribbed slabs: Analysis of the Slabs for Moment and Shears, Ultimate Moment of Resistance, Design for shear, Deflection, Arrangement of Reinforcements.
Flat slabs: Direct design method, Distribution of moments in column strips and middle strip-moment and shear transfer from slabs to columns, Shear in Flat slabs-Check for one way and two way shears-Introduction to Equivalent frame method. Limitations of Direct design method, Distribution of moments in column strips and middle strip sketch showing reinforcement details.

UNIT-IV
Design of Reinforced Concrete Deep Beams & Corbels: Steps of Designing Deep Beams, Design by IS 456. Checking for Local Failures, Detailing of Deep Beams, Analysis of Forces in a Corbels, Design of Procedure of Corbels, Design of Nibs.

UNIT-V
Design of Compression Members: Estimation of Effective Length of a Column, Code Requirements on Slenderness Limits,Design of Short Columns Under Axial Compression, Design of Short Columns Under Compression With Uniaxial Bending,Design of Short Columns Under Axial Compression With Biaxial Bending – Design of Slender Columns sketch showing reinforcement details.
Design of Combined Footings - Distribution of Soil Pressure - Geometry of Two-column Combined Footing – Design Considerations in Two-Column Footings sketch showing reinforcement details.

REFERENCE:
1. Reinforced Concrete Design by S. Unnikrishna Pillai & Devdas Menon; TMGH, New Delhi
2. Design of Reinforced Concrete structures by S. Ramamrutham , Dhanpath Rai Publishing Company
3. Advanced Reinforced Concrete by P.C. Varghese Prentice Hall of INDIA Private Ltd.
4. Design of Reinforced Concrete Structures by N.Subramanian,Oxford University Press.
5. Design Reinforced Concrete Foundations by P.C. Varghese Prentice Hall of INDIA Private Ltd.
6. IS 456-2000
7. SP 16
8. SP 34

THEORY AND APPLICATIONS OF CEMENT COMPOSITES
(Professional Elective – 1)

I-M.Tech.-I-Sem.	**L**	**T**	**P**	**C**
Course Code: 20SEPE102	**3**	**0**	**0**	**3**

Course Outcomes: Upon completion of the course, the students will be able to

1. summarize behavior of composite materials
2. discuss the elastic constant of the materials
3. apply the construction techniques for various cement composite
4. discuss the mechanical properties of cement composite
5. apply, analysis and design of structure elements

UNIT–I

Introduction: Classification and Characteristics of Composite Materials- Basic Terminology, Advantages. Stress-Strain Relations- Orthotropic and Anisotropic Materials, Engineering Constants for Orthotropic Materials, Restrictions on Elastic Constants, Plane Stress Problem, Biaxial Strength, Theories for an Orthotropic Lamina.

UNIT–II

Mechanical Behaviour: Mechanics of Materials Approach to Stiffness- Determination of Relations between Elastic Constants, Elasticity Approach to Stiffness- Bounding Techniques of Elasticity, Exact Solutions - Elasticity Solutions with Continuity, Halpin, Tsai Equations, Comparison of approaches to Stiffness.

UNIT–III

Cement Composites: Types of Cement Composites, Terminology, Constituent Materials And their Properties, Construction Techniques for Fibre Reinforced Concrete – Ferro cement,SIFCON, Polymer Concretes, Preparation of Reinforcement, Casting and Curing.

UNIT–IV

Mechanical Properties of Cement Composites:BehaviorofFerrocement, Fiber Reinforced Concrete in Tension, Compression, Flexure, Shear, Fatigue and Impact, Durability and Corrosion.

UNIT–V

Application of Cement Composites: FRC and Ferrocement- Housing, Water Storage, Boats and Miscellaneous Structures. Composite Materials- Orthotropic and Anisotropic behaviour, Constitutive relationship, Elastic Constants.

Analysis and Design of Cement Composite Structural Elements – Ferro cement, SIFCON and Fibre Reinforced Concrete.

Reference Books:

1. Mechanics of Composite Materials, Jones R. M,, 2nd Ed., Taylor and Francis,BSP Books
2. Ferrocement – Theory and Applications, Pama R. P., IFIC.
3. New Concrete Materials, Swamy R.N.,1stEd.,Blackie,Academic and Professional, Chapman & Hall.

THEORY OF STRUCTURAL STABILITY
(Program Elective – 1)

	L	T	P	C
I-M.Tech.-I-Sem.				
Course Code: 20SEPE103	**3**	**0**	**0**	**3**

Course Outcomes: Upon completion of the course, the students will be able to

1. explain strength, concept and behavior of structures
2. illustrate the column application
3. model the frame with aspect of stability
4. analyze the plate and beam
5. discuss the inelastic buckling and dynamic stability

UNIT – I
Criteria for Design of Structures: Stability, Strength, and Stiffness, Classical Concept of Stability of Discrete and Continuous Systems, Linear and nonlinear behavior.

UNIT – II
Stability of Columns: Axial and Flexural Buckling, Lateral Bracing of Columns, Combined Axial, Flexural and Torsion Buckling.

UNIT – III
Stability of Frames: Member Buckling versus Global Buckling, Slenderness Ratio of Frame Members.

UNIT – IV
Stability of Beams: lateral torsion buckling.
Stability of Plates: axial flexural buckling, shear flexural buckling, buckling under combined loads.

UNIT – V
Introduction to Inelastic Buckling and Dynamic Stability.

Reference Books:
1. Theory of elastic stability, Timoshenko and Gere, Tata Mc Graw Hill.
2. Principles of Structural Stability Theory, Alexander Chajes, Prentice Hall, New Jersey.
3. Structural Stability of columns and plates, Iyengar, N. G. R., Eastern west press Pvt. Ltd.
4. Strength of Metal Structures, Bleich F. Bucking, Tata McGraw Hill, New York.

NUMERICAL METHODS IN STRUCTURAL ENGINEERING
(Professional Elective – 2)

I-M.Tech.-I-Sem. **L T P C**
Course Code: 20SEPE104 **3 0 0 3**

Prerequisites: Mathematics I & II

Course Outcomes: Upon completion of the course, the students will be able to

1. illustrate the different linear equations problems
2. apply the concept of various methods of interpolation
3. adapt the finite difference to various elements
4. make use of numerical differentiation and integration
5. construct the solution using ordinary differential equation

UNIT-I:
Solutions of linear equations: Direct method, Cramer's rule, Guass, Elimination method- Gauss, Jordan elimination, Triangulation (LU Decomposition) method,Iterative methods Jacobi, Iteration method,Gauss ,Siedel iteration, Successive over,relaxation method. Eigen values and eigen vectors: Jacobi method for symmetric matrices,Given's method for symmetric matrices-Householder's method for symmetric matrices-Rutishauser method of arbitrary matrices, Power method.

UNIT-II:
Interpolation:Linear Interpolation, Higher order Interpolation, Lagrange Interpolation, Interpolating polynomials using finites differences, Hermite Interpolation,piece-wise and spline Interpolation.

UNIT-III
Finite Difference and their Applications: Introduction- Differentiation formulas by Interpolating parabolas, Backward and forward and central differences, Derivation of Differentiation formulas using Taylor series- Boundary conditions- Beam deflection,Solution of characteristic value problems, Richardson's extrapolation, Use of unevenly spaced pivotal points,Integration formulae by interpolating parabolas- Numerical solution to spatial differential equations, Application to Simply Supported Beams, Columns & rectangular Plates.

UNIT-IV.
Numerical Differentiation:Difference methods based on undetermined coefficients, optimum choice of step length, Partial differentiation.
Numerical Integration:Method based on interpolation-method based on undetermined coefficient, Gauss,Lagrange interpolation method,Radaua integration method,composite integration method, Double integration using Trapezoidal and Simpson's method, New Marks Method and Application to Beams, Calculations of Slopes & Deflections.

UNIT-V
Ordinary Differential Equation: Euler's method, Backward Euler method, Mid point method, single step method, Taylor's series method, Boundary value problems.

References:
1. Numerical Methods For Scientific and Engineering Computations. M.K.Jain- S.R.K.Iyengar – R.K.Jain Willey Eastern Limited. New Age International (p) Ltd., Publishers,
2. Numerical Methods for Engineering Problems by N. Krishna Raju and K.U. Muthu, M.C. Millan Publishers, New Delhi
3. Numerical Methods for Engineers Stevan C.Chopra, Raymond P. Canal Mc.Graw Hill Book Company.
4. Computer based numerical analysis by Dr. M.Shanta Kumar, Khanna Book publishers New Delhi.

STRUCTURAL HEALTH MONITORING
(Professional Elective –2)

	L	T	P	C
I-M.Tech.-I-Sem.				
Course Code: 20SEPE105	**3**	**0**	**0**	**3**

Course Outcomes: Upon completion of the course, the students will be able to

1. list the cause and factor of health monitoring
2. outline the measure and assessment of system
3. assess the health response using static field testing
4. apply dynamic data analysis using remote system
5. adapt the smart material and EMI techniques for repair and rehabilitation

UNIT – I
Structural Health: Factors affecting Health of Structures, Causes of Distress, Regular Maintenance.

UNIT – II
Structural Health Monitoring: Concepts, Various Measures, Structural Safety in Alteration.
Structural Audit: Assessment of Health of Structure, Collapse and Investigation, Investigation Management, SHM Procedures.

UNIT – III
Static Field Testing: Types of Static Tests, Simulation and Loading Methods, sensor systems and hardware requirements, Static Response Measurement.

UNIT – IV
Dynamic Field Testing: Types of Dynamic Field Test, Stress History Data, Dynamic Response Methods, Hardware for Remote Data Acquisition Systems, Remote Structural Health Monitoring.

UNIT – V
Introduction to Repairs and Rehabilitations of Structures : Case Studies (Site Visits), piezo–electric materials and other smart materials, electro–mechanical impedance (EMI) technique, adaptations of EMI technique.

Reference Books:

1. Structural Health Monitoring, Daniel Balageas, Claus_Peter Fritzen, Alfredo Güemes, John Wiley and Sons.
2. Health Monitoring of Structural Materials and Components_Methods with Applications,
3. Structural Health Monitoring with Wafer Active Sensors, Victor Giurglutiu, Academic Press Inc.

STRUCTURAL OPTIMIZATION
(Professional Elective –2)

I-M.Tech.-I-Sem.	**L**	**T**	**P**	**C**
Course Code: 20SEPE106	**3**	**0**	**0**	**3**

Course Outcomes: Upon completion of the course, the students will be able to

1. illustrate the classical problem and failure modes
2. develop the variational principles to optimization
3. formulate and solve the linear, nonlinear and dynamic programming
4. create geometric and stochastic programming for structural
5. build optimization technique to steel and concrete members

UNIT –I
Introduction : Simultaneous Failure Mode and Design, Classical External Problems.

UNIT –II
Calculus of Variation: Variational Principles with Constraints,

UNIT –III
Linear Programming, Integer Programming, Nonlinear Programming, Dynamic Programming,

UNIT –IV
Geometric Programming **and** Stochastic Programming.

UNIT –V
Applications: Structural Steel and Concrete Members, Trusses and Frames.
Design: Frequency Constraint, Design of Layouts.

Reference Books:
1. Elements of Structural Optimization, Haftka, Raphael T., Gürdal, Zafer, Springer.
2. Variational methods for Structural optimization, Cherkaev Andrej, Springer

ADVANCED CONCRETE TECHNOLOGY LAB -I

	L	T	P	C
I-M.Tech.-I-Sem.				
Course Code: 20SEPC103	**0**	**0**	**4**	**2**

Prerequisites: Concrete Technology theory and lab

Course Outcomes: Upon completion of the course, the students will be able to

1. develop gradation chart and test for aggregate
2. make use of fresh and hardened concrete test to assess the quality
3. evaluate the durability aspect test for concrete
4. demonstrate the different reinforcement system
5. assess the different influencing parameter and admixture in concrete

List of Experiments/Assignments:

1. Gradation Charts of Aggregates.
2. Bulking of fine Aggregate.
3. Aggregate Crushing and Impact value
4. Fineness of cement using blains apparatus
5. Concrete Mix design for different grades of concrete
6. Air Entrainment Test on Fresh Concrete
7. Marsh Cone Test
8. Bleeding of Concrete
9. Influence of W/C Ratio on Strength and Aggregate / Cement Ratio on Strength & Workability.
10. Influence of Different Chemical Admixtures on Concrete
11. Water permeability Test for Concrete
12. Non Destructive Testing of Concrete (Re-Bound Hammer)

Reference Books:

1. Advanced Concrete Technology Lab -I Manual, Department of Civil Engineering, CMRIT, Hyd

NUMERICAL ANALYSIS LAB

I-M.Tech.-I-Sem.	L	T	P	C
Course Code: 20SEPC104	0	0	4	2

Course Outcomes: Upon completion of the course, the students will be able to

1. find roots of non-linear equations by bisection method and newton's method
2. build the curve fitting by least square approximations
3. solve the system of linear equations using various methods
4. compare the solution of integrate numerically using trapezoidal and simpson's rules
5. construct ordinary differential equations by euler and runge- kutta methods

Syllabus Contents:

1. Find the Roots of Non-Linear Equation Using Bisection Method.
2. Find the Roots of Non-Linear Equation Using Newton's Method.
3. Curve Fitting by Least Square Approximations.
4. Solve the System of Linear Equations Using Gauss - Elimination Method.
5. Solve the System of Linear Equations Using Gauss - Seidal Iteration Method.
6. Solve the System of Linear Equations Using Gauss - Jorden Method.
7. Integrate numerically using Trapezoidal Rule.
8. Integrate numerically using Simpson's Rules.
9. Numerical Solution of Ordinary Differential Equations By Euler's Method.
10. Numerical Solution of Ordinary Differential Equations ByRunge- Kutta Method.
11. Practice with Sci lab

Reference Books:

1. Numerical Analysis Lab Manual, Department of Civil Engineering, CMRIT, Hyd

RESEARCH METHODOLOGY AND IPR

	L	T	P	C
I-M.Tech.-I-Sem.				
Course Code: 20MC101	**2**	**0**	**0**	**2**

Course Outcomes: Upon completion of the course, the students will be able to

1. formulate research problem
2. analyze research related information
3. follow research ethics
4. perceive nature of IPR and its development.
5. Outline the patent rights

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.

UNIT - III: 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 - IV: 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 - V: Patent Rights: Scope of Patent Rights. Licensing and transfer of technology. Patent information and databases. Geographical Indications.

UNIT - VI: 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.

References:

1. Stuart Melville and Wayne Goddard, “Research methodology: an introduction for science & engineering students’”
2. Wayne Goddard and Stuart Melville, “Research Methodology: An Introduction”
3. Ranjit Kumar, 2nd Edition, “Research Methodology: A Step by Step Guide for beginners”
4. Halbert, “Resisting Intellectual Property”, Taylor & Francis Ltd ,2007.
5. Mayall , “Industrial Design”, McGraw Hill, 1992.
6. Niebel , “Product Design”, McGraw Hill, 1974.
7. Asimov , “Introduction to Design”, Prentice Hall, 1962.
8. Robert P. Merges, Peter S. Menell, Mark A. Lemley, “ Intellectual Property in New Technological Age”, 2016.

ENGLISH FOR RESEARCH PAPER WRITING
(AUDIT COURSE - 1)

	L	T	P	C
I-M.Tech.-I-Sem.				
Course Code: 20AC101	**2**	**0**	**0**	**0**

OUTCOME: Upon completion of the course, the students will be able to

1. determine that how to improve your writing skills and level of readability
2. Learn about what to write in each section
3. determine 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, 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, and skills are needed when writing the Conclusions

UNIT- VI

Useful phrases, how to ensure paper is as good as it could possibly be the first- time submission

Reference:

1. Goldbort R Writing for Science, Yale University Press (available on Google Books)
2. Day R How to Write and Publish a Scientific Paper, Cambridge University Press
3. Highman N, 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

VALUE EDUCATION
(AUDIT COURSE - 1)

I-M.Tech.-I-Sem. **L T P C**
Course Code: 20AC102 **2 0 0 0**

OUTCOME: Upon completion of the course, the students will be able to

1. Knowledge of self-development
2. Learn the importance of Human values
3. Developing the overall personality

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

UNIT- IV

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.

REFERENCE:

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

CONSTITUTION OF INDIA
(AUDIT COURSE - 1)

I-M.Tech.-I-Sem. **L T P C**
Course Code: 20AC103 **2 0 0 0**

OUTCOME: Students will be able to:

1. Discuss the growth of the demand for civil rights in India for the bulk of Indians before the arrival of Gandhi in Indian politics.
2. Discuss the intellectual origins of the framework of argument that informed the conceptualization of social reforms leading to revolution in India.

UNIT- I

History of Making of the Indian Constitution: History Drafting Committee, (Composition & Working), Preamble Salient Features

UNIT- II

Contours of Constitutional Rights & Duties: Fundamental Rights, Right to Equality, Right to Freedom,Right against Exploitation, Right to Freedom of Religion, Cultural and Educational Rights, Right to Constitutional Remedies, Directive Principles of State Policy ,Fundamental Duties.

UNIT- III

Organs of Governance: Parliament, Composition, Qualifications and Disqualifications, Powers and Functions, Executive, President, Governor, Council of Ministers, Judiciary, Appointment and Transfer of Judges, Qualifications, Powers and Functions

UNIT-IV

Local Administration: District's Administration head: Role and Importance, Municipalities: Introduction, Mayor and role of Elected Representative, CEO of Municipal Corporation, Pachayat Raj: Introduction, PRI: Zilla Pachayat., lected officials and their roles, CEO Zilla Pachayat: Position and role., Block level: Organizational Hierarchy (Different departments), Village level: Role of Elected and Appointed officials, Importance of grass root democracy

UNIT- V

Election Commission: Election Commission: Role and Functioning., Chief Election Commissioner and Election Commissioners, State Election Commission: Role and Functioning, Institute and Bodies for the welfare of SC/ST/OBC and women.

REFERENCE:

1. The Constitution of India, 1950 (Bare Act), Government Publication.
2. Dr. S. N. Busi, Dr. B. R. Ambedkar framing of Indian Constitution, 1st Edition, 2015.
3. M. P. Jain, Indian Constitution Law, 7th Edn., Lexis Nexis, 2014.
4. D.D. Basu, Introduction to the Constitution of India, Lexis Nexis, 2015.

I-M.TECH.-II-SEMESTER SYLLABUS

FEM IN STRUCTURAL ENGINEERING

	L	T	P	C
I-M.Tech.-II-Sem.				
Course Code: 20SEPC201	**3**	**0**	**0**	**3**

Course Outcomes: Upon completion of the course, the students will be able to

1. explain the different methods of basics of analysis
2. make use of the beam elements and method of weighted residuals to structural
3. analyse the various types of elements for modeling
4. adopt the constant strain triangle and rectangular elements to solid mechanics
5. solve the problems using commercial FEA software

UNIT - I

Introduction: History and Applications. Spring and Bar Elements, Minimum Potential Energy Principle, Direct Stiffness Method, Nodal Equilibrium equations, Assembly of Global Stiffness Matrix, Element Strain and Stress.

UNIT –II

Beam Elements: Flexure Element, Element Stiffness Matrix, Element Load Vector.
Method of Weighted Residuals: Galerkin Finite Element Method, Application to Structural Elements, Interpolation Functions, Compatibility and Completeness Requirements, Polynomial Forms, Applications.

UNIT –III

Types: Triangular Elements, Rectangular Elements, Three-Dimensional Elements, Isoparametric Formulation, Axi-Symmetric Elements, Numerical Integration, Gaussian Quadrature.

UNIT-IV

Application to Solid Mechanics: Plane Stress, CST Element, Plane Strain Rectangular Element, Isoparametric Formulation of the Plane Quadrilateral Element, Axi- Symmetric Stress Analysis, Strain and Stress Computations.

UNIT-V

Computer Implementation of FEM procedure, Pre-Processing, Solution, Post-Processing, Use of Commercial FEA Software.

Reference Books:

1. C.S. Krishna Murthy Finites Element Method. MC Graw-Hill Publishers.
2. Finite Element Methods in Engineering, Belegundu A.D.,Chandrupatla,T.R.,Prentice Hall India.
3. Finite Element Analysis in Engineering, Md. Jalaludeen.

STRUCTURAL DYNAMICS

	L	T	P	C
I-M.Tech.-II-Sem.				
Course Code: 20SEPC202	**3**	**0**	**0**	**3**

Course Outcomes: Upon completion of the course, the students will be able to

1. explain the basic concepts Damped, Undamped of free and forced vibration of SDOF
2. formulate differential equation and solution of motion for SDOF using various methods
3. apply the Multi degree of freedom equation problem for natural frequencies and mode shapes
4. analyse the higher modes and continuous system of simple beams for various end condition
5. aiscuss the response and excitation for lumped SDOF system and Multi storey RC building

Prerequisites: Structural Analysis I & II

UNIT I:

Theory of vibrations: Introduction - Elements of vibratory system - Degrees of Freedom - Continuous System - Lumped mass idealization - Oscillatory motion - Simple Harmonic motion - Vectorial representation of S.H.M. - Free vibrations of single degree of freedom system - undamped and damped vibrations - critical damping - Logarithmic decrement - Forced vibration of SDOF systems - Harmonic excitation - Vibration Isolation -Dynamic magnification factor – Phase angle.

UNIT II

Introduction to Structural Dynamics : Fundamental objectives of dynamic analysis -Types of prescribed loading - Methods of discretization - Formulation of equations of motion by different methods – Direct equilibration using Newton's law of motion / D'Alembert's principle, Principle of virtual work and Hamilton principle.

Single Degree of Freedom Systems : Formulation and solution of the equation of motion - Free vibration response - Response to Harmonic, Periodic, Impulsive and general dynamic loadings - Duhamel integral.

UNIT III

Multi Degree of Freedom Systems : Selection of the degrees of Freedom - Evaluation of structural property matrices - Formulation of the MDOF equations of motion -Undamped free vibrations - Solutions of Eigen value problem for natural frequencies and mode shapes - Analysis of Dynamic response – Normal co-ordinates - Uncoupled equations of motion - Orthogonal properties of normal modes - Mode superposition procedure.

UNIT IV

Practical Vibration Analysis: Introduction - Stodola method - Fundamental mode analysis - Analysis of second and higher modes - Holzer method - Basic procedure.

Continuous Systems: Introduction - Flexural vibrations of beams - Elementary case – Derivation of governing differential equation of motion - Analysis of undamped free vibrations of beams in flexure - Natural frequencies and mode-shapes of simple beams with different end conditions - Principles of application to continuous beams.

UNIT V

Introduction to Earthquake Analysis: Deterministic Earthquake Response: Systems on Rigid Foundations : Types of Earthquake Excitations – Lumped SDOF Elastic Systems, Translational Excitations Grreliyed – coordinate SDOF Elastic Systems, Translational Excitations, Linear Static Method – Analysis for obtaining response of multi storeyes RC Building.

References:

1. Dynamics of Structures by Anil K. Chopra, Pearson Education (Singapore), Delhi.
2. Structural Dynamics by Mario Paz, C.B.S Publishers, New Delhi.
3. I.S: 1893 (Part 1) - 2016, "Code of practice for Earthquake resistant design of Structures"

ADVANCED STEEL DESIGN
(Professional Elective – 3)

	L	T	P	C
I-M.Tech.-II-Sem.				
Course Code: 20SEPE201	**3**	**0**	**0**	**3**

Pre requisites: Design of Steel Structures & Structural Analysis

Course Outcomes: Upon completion of the course, the students will be able to

1. evaluate the efficiency of different types of joint and design the welded connections.
2. ilustrate the welded, bolted bracket and moment resistant connection for beam column joint.
3. design the various industrial structural elements
4. analysis the wind effect on steel girder bridge
5. design the beams and portal frames using plastic analysis

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.

References:

1. Limit State Design of Steel Structures S.K. Duggal Mc Graw Hill Education Pvt Ltd. New Delhi.
2. Design of Steel Structures. P. Dayaratnam, Publisher : S. Chand.
3. Design Steel Structures Vol.II, Dr. Ramachandra & Vivendra Gehlot Scientific Publishes Journals Department.
4. Design of Steel Structures. P.Dayaratnam, Publisher : S. Chand, Edition .
5. Indian Standard Code – IS – 800-2007.
6. Indian Standard Code – IS – 875 – Part III - 2015

DESIGN OF FORM WORK
(Professional Elective – 3)

	L	T	P	C
I-M.Tech.-II-Sem.				
Course Code: 20SEPE202	**3**	**0**	**0**	**3**

Course Outcomes: Upon completion of the course, the students will be able to

1. select proper formwork, accessories and material
2. identify the materials for horizontal and vertical supports
3. design the form work for various elements
4. choose the flying formwork for various structures
5. Judge the formwork failures through case studies

UNIT- I
Introduction: Requirements and Selection of Formwork.

UNIT- II
Formwork Materials- Timber, Plywood, Steel, Aluminium, Plastic, and Accessories. Horizontal and Vertical Formwork Supports.

UNIT- III
Formwork Design: Concepts, Formwork Systems and Design for Foundations, Walls, Columns, Slab and Beams.
Formwork Design for Special Structures: Shells, Domes, Folded Plates, Overhead Water Tanks, Natural Draft Cooling Tower, Bridges.

UNIT- IV
Flying Formwork: Table Form, Tunnel Form, Slip Form, Formwork for Precast Concrete, Formwork Management Issues –Pre- and Post-Award.

UNIT- V
Formwork Failures : Causes and Case studies in Formwork Failure, Formwork Issues in Multi-Story Building Construction.

Reference Books:

1. Formwork for Concrete Structures, Peurify, Mc Graw Hill India.
2. Concrete Technology by A.R. Santhakumar, Oxford Univ. Press
3. Formwork for Concrete Structures, Kumar NeerajJha, Tata McGraw Hill Education
4. IS14687: 1999, False work for Concrete Structures - Guidelines, BIS.

DESIGN OF MASONRY STRUCTURES
(Professional Elective – 3)

	L	T	P	C
I-M.Tech.-II-Sem.				
Course Code: 20SEPE203	**3**	**0**	**0**	**3**

Prerequisites: Design of reinforced concrete structures

Course Outcomes: Upon completion of the course, the students will be able to

1. explain the masonry material, the compression behavior and distribution of lateral forces
2. illustrate reinforced masonry members in plane and out plane loading
3. discuss the functions of interaction of super and sub structure elements
4. analyse the shear strength and ductility of reinforced masonry members
5. choose the elastic and inelastic analysis for different modeling techniques

UNIT- I
Introduction: Historical Perspective, Masonry Materials, Masonry Design Approaches, Overview of Load Conditions, Compression Behaviour of Masonry, Masonry Wall Configurations, Distribution of Lateral Forces.

UNIT- II
Flexural Strength of Reinforced Masonry Members: In plane and Out-of-plane Loading.

UNIT- III
Interactions: Structural Wall, Columns and Pilasters, Retaining Wall, Pier and Foundation.

UNIT- IV
Shear Strength and Ductility of Reinforced Masonry Members.

UNIT- V
Prestressed Masonry - Stability of Walls, Coupling of Masonry Walls, Openings, Columns, Beams. **Elastic and Inelastic Analysis**, Modeling Techniques, Static Push Over Analysis and use of Capacity Design Spectra.

Reference Books:
1. Masonry Structures: Behavior and Design, Hamid Ahmad A. and Drysdale Robert G.
2. Design of Reinforced Masonry Structures, Narendra Taly, ICC.
3. Mechanics of Masonry Structures, Editor: Maurizio Angelillo.
4. Earthquake-resistant Design of Masonry Buildings,Toma_evi_Miha, Imperial College Press

THEORY OF THIN PLATES & SHELLS
(Professional Elective – 4)

I-M.Tech.-II-Sem. **L T P C**
Course Code: 20SEPE204 **3 0 0 3**

Prerequisites: Theory of Elasticity, Structural Analysis

Course Outcomes: Upon completion of the course, the students will be able to

1. illustrate the space curves and shell theory and deriving the equilibrium equation
2. determine the deflection theory using boundary condition
3. solve circular plates for symmetrical bending with different loading condition
4. analyze the shell and cylindrical shell structural behavior
5. apply double curvature for shells and design the various parabolic shells

UNIT I
Introduction: Space Curves, Surfaces, Shell Co-ordinates, Strain Displacement Relations, Assumptions in Shell Theory, Displacement Field Approximations, Stress Resultants, Equation of Equilibrium using Principle of Virtual Work, Boundary Conditions.

UNIT II
Small Deflection Theory of Thin Rectangular Plates : Assumptions – Derivation of governing differential equation for thin plates – Boundary conditions – simply supported plate under sinusoidal load – Navier solution – Application to different cases – Levy's solution for various boundary conditions subjected to different loadings like uniform and hydrostatic pressure.

UNIT III
Circular Plates: Differential Equation for symmetrical bending of Laterally loaded circular Plates – Uniformly loaded circular plates –circular plate concentrically loaded – circular plate loaded at center

UNIT IV
Shells – functional behaviour – examples – structural behaviour of shells classification of shells – Definitions – various methods of analysis of shells – merits and demerits of each method – 2D. Membrane equation. Equations of equilibrium: Derivation of stress resultants – cylindrical shells – Flugges simulations equations.

UNIT V
Introduction to the shells of Double curvatures: Geometry, analysis and design of elliptic paraboloid, conoid and hyperbolic parabolic shapes, inverted umbrella type. Axi- Symmetrical shells: General equation - Analysis and axi-symmetrical by membrane theory. Application to spherical shell and hyperboloid of revolution cooling towers.

REFERENCES:
1. Theory of Plates & Shells –Stephen, P.Timoshenko, S.Woinowsky-Krieger – Tata MC Graw Hill
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
4. Shell Analysis By N.K.Bairagi. Khanna Publishers, New Delhi.
5. Design of Shells and Folded Plates by P.C. Varghese, PHI Learning Pvt. Ltd

ADVANCED DESIGN OF FOUNDATIONS
(Professional Elective – 4)

I-M.Tech.-II-Sem.	**L**	**T**	**P**	**C**
Course Code: 20SEPE205	**3**	**0**	**0**	**3**

Course Outcomes: Upon completion of the course, the students will be able to

1. choose the suitability of soil strata for various projects
2. design shallow foundations based on the bearing capacity of soil
3. design the pile foundation based on loads
4. analysis the well foundation based on the IS and IRC code
5. develop the sheeting and bracing for various coffer dams

UNIT- I

Planning of Soil Exploration for Different Projects, Methods of Subsurface Exploration, Methods of Borings along with Various Penetration Tests.

UNIT- II

Shallow Foundations, Requirements for Satisfactory Performance of Foundations, Methods of Estimating Bearing Capacity, Settlements of Footings and Rafts, Proportioning of Foundations using Field Test Data, Pressure - Settlement Characteristics from Constitutive Laws.

UNIT- III

Pile Foundations, Methods of Estimating Load Transfer of Piles, Settlements of Pile Foundations, Pile Group Capacity and Settlement, Laterally Loaded Piles, Pile Load Tests, Analytical Estimation of Load-Settlement Behavior of Piles, Proportioning of Pile Foundations, Lateral and Uplift Capacity of Piles.

UNIT- IV

Well Foundation, IS and IRC Code Provisions, Elastic Theory and Ultimate Resistance Methods. Tunnels and Arching in Soils, Pressure Computations around Tunnels.

UNIT-V

Open Cuts: Sheeting and Bracing Systems in Shallow and Deep Open Cuts in Different Soil Types.
Coffer Dams: Various Types, Analysis and Design, Foundations under uplifting loads, Soil-structure interaction

Reference Books:

1. Design of foundation system, N.P. Kurian, Narosa Publishing House
2. Foundation Analysis and Design, J. E. Bowles, Tata McGraw Hill New York
3. Analysis and Design of Substructures, Sawmi Saran, Oxford and IBH Publishing Co. Pvt. Ltd, New Delhi

DESIGN OF INDUSTRIAL STRUCTURES
(Program Elective – 4)

	L	T	P	C
I-M.Tech.-II-Sem.				
Course Code: 20SEPE206	**3**	**0**	**0**	**3**

Prerequisites: Design of Steel Structures & Structural Analysis

Course Outcomes: Upon completion of the course, the students will be able to

1. develop the concept of planning & functional requirement of industrial standards
2. analyze the light gauge sections for multiple stiffened compression elements
3. analyse & design of different shape of bunker and silos
4. design the chimneys with combined effect of wind and temperature stresses
5. formulate the design principle for cylindrical shell

UNIT 1
Planning of Industrial Structures – types of industrial structures – different components of industrial structures – Bracings of Industrial Buildings – Design of Steel Industrial Buildings.

UNIT 2
Thin Walled / Cold Formed Steel Members : Definitions – Local Bucking of Thin-Elements-Post Buckling of Thin-Elements – Light Guage Steel Columns and Compression Members – Form-Factor for Columns and Compression Members – Behaviour of Stiffened Elements Under Uniform Compression – Multiple Stiffened Compression Elements –Effective Length of Light Gauge Steel Compression Members – Light Gauge Steel Tension Members.

UNIT 3
RC Bunkers & Silos : Introduction – Janssen's Theory – Airy's Theory – Design of Square, Rectangular and Circular Bunkers ; Design of Silos.

UNIT 4
RC Chimneys : Introduction – Wind Pressure – Stresses in Chimney Shaft Due to Self-Weight and Wind – Stresses in Horizontal Reinforcement Due to Wind Shear – Stresses Due to Temperature Difference – Combined Effect of Self Load, Wind and Temperature – Temperature Stresses in Horizontal Reinforcement Problems.

UNIT 5
Design Principles of Cylindrical Shells & Design Problems.

References:
1. Advanced Reinforced Concrete Design, By N. Krishna Raju (CBS Publishers & Distributors).
2. Design of Steel Structures, By Ram Chandra and Virendra Gehlot vol-II.
3. Design of Steel Structures, By Duggal - Tata McGraw-Hill publishers.

STRUCTURAL DESIGN LAB

I-M.Tech.-II-Sem. **L T P C**
Course Code: 20SEPC203 **0 0 4 2**

Course Outcomes: Upon completion of the course, the students will be able to

1. design the static and dynamic analysis for building structure using software
2. design rcc and steel structures using software
3. analyse the folded plate using software
4. develop the program for slab and beam using excel sheet
5. develop the program for column and combined footings

Syllabus Content:
Design and detailed drawing of complete G+ 3 structures by individual student using latest relevant IS codes.

List of Experiments

1. Static and Dynamic analysis of Building structure using software (STAAD PRO)
2. Design of RCC and Steel structure using software (STAAD PRO)
3. Analysis of truss (using Staad. Pro)
4. Preparation of EXCEL sheets for structural design.
   a) Program for design of slabs. Using Excel
   b) Program for design of beams. Using Excel
   c) Program for design of column using Excel
   d) Program for Design of a combined footing using Excel

Reference Books:

1. Structural design Lab Manual, Department of Civil Engineering, CMRIT, Hyd

ADVANCED CONCRETE TECHNOLOGY LAB -II

I-M.Tech.-II-Sem. **L T P C**
Course Code: 20SEPC204 **0 0 4 2**

Course Outcomes: On completion of this course, students are able to

1. make use of fresh and hardened concrete test to assess the quality.
2. adapt accelerated curing and NDT of concrete.
3. evaluate the durability aspect test for Concrete using Nacl and H2SO4.
4. demonstrate the temperature and hyderation of concrete.
5. assess the strain and shrinkage of concrete.

List of Experiments

1. Determine Workability Tests on Fresh Self Compacting Concrete (U, L –Box & V Funnel)
2. Non Destructive Testing of Concrete (Ultra sonic pulse velocity meter)
3. Accelerated Curing of Concrete
4. Durability test for concrete (using $H_2SO_{4)}$
5. Water Absorption Test
6. Determine Modulus of Elasticity of Concrete
7. Effect of Nacl on Concrete
8. Influence of temperature on behavior of concrete (Muffle Furnace)
9. Heat of hydration
10. Determine the strain on concrete element
11. Shrinkage test on concrete elements

Reference Books:

1. Advanced concrete Lab-II Lab Manual, Department of Civil Engineering, CMRIT, Hyd

MINI PROJECT WITH SEMINAR

	L	T	P	C
I-M.Tech.-II-Sem.				
Course Code: 20SEPR201	**0**	**0**	**4**	**2**

Mini Project will have mid semester presentation and end semester presentation. Mid semester presentation will include identification of the problem based on the literature review on the topic referring to latest literature available.

End semester presentation should be done along with the report on identification of topic for the work and the methodology adopted involving scientific research, collection and analysis of data, determining solutions highlighting individuals' contribution.

Continuous assessment of Mini Project at Mid Sem and End Sem will be monitored by the supervisor

PEDAGOGY STUDIES
(AUDIT COURSE - 2)

I-M.Tech.-II-Sem. **L T P C**
Course Code: 20AC201 **2 0 0 0**

OUTCOME: Students will be able to

1. What pedagogical practices are being used by teachers in formal and informal classrooms in developing countries?
2. What is the evidence on the effectiveness of these pedagogical practices, in what conditions, and with what population of learners?
3. How can teacher education (curriculum and practicum) and the school curriculum and guidance materials best 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 follow-up, 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.

REFERENCE:

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'

STRESS MANGEMENT BY YOGA
(AUDIT COURSE - 2)

	L	T	P	C
I-M.Tech.-II-Sem.				
Course Code: 20AC202	**2**	**0**	**0**	**0**

UNIT-I:

Definitions of Eight parts of yoga. (Ashtanga)

UNIT-II:

Yam and Niyam.

UNIT-III:

Do`s and Don't's in life. i) Ahinsa, satya, astheya, bramhacharya and aparigraha
ii) Shaucha, santosh, tapa, swadhyay, ishwarpranidhan

UNIT-IV:

Asan and Pranayam

UNIT-V:

1. Various yoga poses and their benefits for mind & body
2. Regularization of breathing techniques and its effects-Types of pranayam

TEXT BOOKS/ REFERENCES:

1. "Yogic Asanas for Group Tarining-Part-I": Janardan Swami Yogabhyasi Mandal, Nagpur
2. "Rajayoga or conquering the Internal Nature" by Swami Vivekananda, Advaita Ashrama (Publication Department), Kolkata

PERSONALITY DEVELOPMENT THROUGH LIFE ENLIGHTENMENT SKILLS (AUDIT COURSE - 2)

	L	T	P	C
I-M.Tech.-II-Sem.				
Course Code: 20AC203	**2**	**0**	**0**	**0**

UNIT-I:

Neetisatakam-Holistic development of personality: Verses- 19,20,21,22 (wisdom), Verses- 29,31,32 (pride & heroism) Verses- 26,28,63,65 (virtue)

UNIT-II:

Neetisatakam-Holistic development of personality : Verses- 52,53,59 (dont's) Verses- 71,73,75,78 (do's)

UNIT-III:

Approach to day to day work and duties: Shrimad Bhagwad Geeta: Chapter 2-Verses 41, 47,48, Chapter 3-Verses 13, 21, 27, 35, Chapter 6-Verses 5,13,17, 23, 35, Chapter 18-Verses 45, 46, 48.

UNIT-IV:

Statements of basic knowledge: Shrimad Bhagwad Geeta: Chapter2-Verses 56, 62, 68 Chapter 12 - Verses 13, 14, 15, 16,17, 18 Personality of Role model.

UNIT-V:

Shrimad Bhagwad Geeta: Chapter2-Verses 17, Chapter 3-Verses 36,37,42, Chapter 4-Verses 18, 38,39 Chapter18 – Verses 37,38,63

TEXT BOOKS/ REFERENCES:

1. "Srimad Bhagavad Gita" by Swami Swarupananda Advaita Ashram (Publication Department), Kolkata.
2. Bhartrihari's Three Satakam (Niti-sringar-vairagya) by P.Gopinath, Rashtriya Sanskrit Sansthanam, New Delhi.

II-M.TECH.-I-SEMESTER SYLLABUS

EARTHQUAKE RESISTANT DESIGN OF BUILDINGS

(Professional Elective – 5)

II-M.Tech.-I-Sem.	**L**	**T**	**P**	**C**
Course Code: 20SEPE301	**3**	**0**	**0**	**3**

Course Outcomes: On completion of this course, students are able to

1. Illustrate the earthquakes based on the engineering seismology
2. Explain the concept of design for earthquake loads and dynamic analysis using response spectrum
3. Outline the earthquake resistant design for reinforced concrete building using IS code method.
4. Design of rectangular and flanged shear walls
5. Apply the ductile detailing for RC building as per IS13920 and seismic evaluation and retrofitting

UNIT - I

Engineering Seismology: Earthquake phenomenon cause of earthquakes-Faults- Plate tectonics-Seismic waves- Terms associated with earthquakes-Magnitude/Intensity of an earthquake-scales-Energy released-Earthquake measuring instruments-Seismoscope,Seismograph, accelerograph-Characteristics of strong ground motions- Seismic zones of India. Introduction-Functional planning-Continuous load path-Overall form-simplicity and symmetry-elongated shapes-stiffness and strength - Seismic design requirements-regular and irregular configurations-basic assumptions.

UNIT - II

Conceptual Design - Horizontal and Vertical Load Resisting Systems ,System and Members for Lateral Loads and High Rise / Tall Structures. Twisting of Buildings, Flexible Building and Rigid Building Systems. Strength and Stiffness ,Ductility ,Definition, Ductility Relationships, Choice of construction Materials,Unconfined Concrete & Confined Concrete Design Earthquake Loads, Basic Load Combinations, Permissible Stresses. Seismic Methods of Analysis , Static Method, Equivalent Lateral Force Method. Dynamic Analysis, Response Spectrum Method.

UNIT - III

Introduction to Earthquake Resistant Design – Seismic Design Requirements and Methods.RC Buildings – IS Code based Method.- Vertical Irregularities – Mass Irregularity Torsional Irregularity - Plan Configuration Problem - Design Lateral Force, Base Shear Evaluation – Lateral Distribution of Base Shear – Structural Walls Strategies and the Location of Structural Walls – Sectional Shapes – Behaviour of Unreinforced and Reinforced Masonry Walls – Behaviour of Walls Box Action and Bands – Behaviour of infill Walls - Non Structural Elements – Failure Mechanism of Nonstructural Elements – Effects of Nonstructural Elements on Structural System – Analysis – Prevention of Damage to Nonstructural Elements – Isolation of Non-Structures.

UNIT - IV

Design 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 – Behaviour of Coupled Shear Walls.

UNIT - V

Ductility Considerations in Earthquake Resistant Design of RC Buildings: Introduction- Impact of Ductility- Requirements for Ductility- Assessment of Ductility- Factors affecting Ductility- Ductile detailing considerations as per IS 13920. Behavior of beams, columns and joints in RC buildings during earthquakes-Vulnerability of open ground storey and short columns during earthquake-Seismic Evaluation and Retrofitting. Capacity Based Design: Introduction to Capacity Design, Capacity Design for Beams and Columns-Case studies.

REFERENCES:

1. Earthquake Resistant Design of structures ,S. K. Duggal, Oxford University Press
2. Earthquake Resistant Design of structures ,Pankaj Agarwal and Manish Shrikhande, PHI Pvt Ltd.
3. Earthquake Tips – Learning Earthquake Design and Construction C.V.R. Murty

Reference Codes:

1. IS: 1893(Part-1)-2016."Criteria for Earthquake Resistant,Design of structures."B.I.S., New Delhi.
2. IS:4326-1993"Earthquake Resistant Design and Construction of Building", B.I.S., New Delhi.
3. IS:13920-2016,Ductile detailing of concrete structures subjected to seismic force Guidelines

DESIGN OF PRESTRESSED CONCRETE STRUCTRUES
(Professional Elective – 5)

	L	T	P	C
II-M.Tech.-I-Sem.				
Course Code: 20SEPE302	**3**	**0**	**0**	**3**

Course outcomes: At the end of the course, students will be able to

1. design of section for limit state of collapse in flexural and axial tension
2. analysis of continuous beam , portal structure and composite beams
3. design of pre-stressed compression member for long and biaxial bending column
4. design of pre-stressed one way, two way, flat and continuous concrete slabs
5. apply the pre-stressed system for various elements

UNIT I:
Design of Prestressed Concrete Sections- Design of sections for flexure, Minimum section modulus- prestressing force- Limitation of prestress in long spans- limiting zone for the prestressing force- Design of sections for the limit state of collapse in flexure-Design of sections for axial tension.

UNIT II:
Statically Indeterminate Structures: Primary and secondary moments – methods of Analysis of secondary moments. –Analysis of continuous beams and simple portal frames (single bay and single storey)
Composite Beams: Different Types- Propped and Unpropped- stress distribution- Differential shrinkage- Analysis of composite beams- General design considerations.

UNIT III:
Design of sections for Compression and Bending: Load- Moment Interaction curves for prestressed concrete short columns-Design of long prestressed columns-design of prestressed concrete compression members in biaxial bending- practical design considerations-design of prestressed sections for shear and torsion.

UNIT IV:
Prestressed Concrete Slabs: Types of prestressed concrete floor slabs- design of prestressed concrete one way and two way slabs—design of prestressed concrete simple flat slabs and continuous flat slab floors.

UNIT V:
Prestressed Concrete Pipes, Tanks, Poles and Piles: Circular prestressing- Types of prestressed concrete pipes- Design of prestressed concrete pipes- analysis and design of prestressed concrete tanks-Design of prestressed concrete poles, partially prestressed pretensioned poles-advantages of prestressed concrete piles-types of prestressed concrete piles- design considerations- pile reinforcements- pile shoes-sheet piles.

References:
1. Prestressed Concrete,krishnanraju N.,Tata Mc Graw Hill,New Delhi.
2. Design of Prestressed Concrete structure,Lin T.Y..,Asia Publication house.
3. Prestressed Concrete by K.V.muthu PHI learning Pvt.CEO
4. Limited state design of prestressed concrete,Gutan Y..,Applied science publishers.
5. Is:1343-2012-Code of Practice for Prestressed Concrete.

ADVANCED STRUCTURAL ANALYSIS
(Professional Elective – 5)

	L	T	P	C
II-M.Tech.-I-Sem.				
Course Code: 20SEPE303	**3**	**0**	**0**	**3**

Pre requisites: Structural Analysis I & II

Course outcomes: At the end of the course, students will be able to

1. illustrate the formulation of stiffness and flexibility equation for flexural elements
2. extend the stiffness matrix using direct stiffness method
3. analysis of plane frames including side sway for single story, single bay by flexibility method
4. analyse the grid and gable frame by stiffness method
5. apply static condensation and sub structuring techniques

UNIT I

Introduction to matrix methods of analysis - statical indeterminacy and kinematical indeterminacy - degree of freedom - coordinate system - structure idealization stiffness and flexibility matrices - suitability element stiffness equations - elements flexibility equations - mixed force - displacement equations - for truss element, beam element and torsional element.

Transformation of coordinates - element stiffness matrix - and load vector - local and global coordinates.

UNIT II

Assembly of stiffness matrix from element stiffness matrix - direct stiffness method - general procedure - banded matrix - semi bandwidth - assembly by direct stiffness matrix method.

UNIT III

Analysis of plane truss - continuous beams with and without settlement - plane frame including side sway single storey, single – bay and garde frame by flexibility method using system approach by flexibility methods and gables frames by Gable System Approach.

UNIT IV

Analysis of plane truss - continuous beams with and without settlement - plane frame including sides sway, grids and gable frames by stiffness methods, single bay – two storey, two bay single – storey.

UNIT V. Special analysis procedures - static condensation and sub structuring - initial and thermal stresses.

REFERENCES

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 S.A by Pandit & Gupta
4. Matrix Structural Analysis by Madhu B. Kanchi.
5. Matrix Methods of Structural Analysis by J.Meek.
6. Structural Analysis by Ghali and Neyveli.
7. Structural Analysis by Devdas Menon, Narosa Publishing Housing Pvt Ltd.

COMPOSITE MATERIALS
(Open Elective)

II-M.Tech.-I-Sem. **L T P C**
Course Code: 20MEOE301 **3 0 0 3**

Course outcomes: At the end of the course, students will be able to

1. outline the characteristics and effect of reinforcement in composite materials.
2. illustrate the various fiber reinforcement properties and its application.
3. discuss the manufacturing process of metal matrix composites.
4. analyze the various methods for polymer matrix composites.
5. determine the various failure of composite materials.

UNIT–I

Introduction: Definition – Classification and characteristics of Composite materials. Advantages and application of composites. Functional requirements of reinforcement and matrix. Effect of reinforcement (size, shape, distribution, volume fraction) on overall composite performance.

UNIT – II

Reinforcements: Preparation-layup, curing, properties and applications of glass fibers, carbon fibers, Kevlar fibers and Boron fibers. Properties and applications of whiskers, particle reinforcements. Mechanical Behavior of composites: Rule of mixtures, Inverse rule of mixtures. Isostrain and Isostress conditions.

UNIT – III

Manufacturing of Metal Matrix Composites: Casting – Solid State diffusion technique, Cladding – Hot isostatic pressing. Properties and applications. Manufacturing of Ceramic Matrix Composites: Liquid Metal Infiltration – Liquid phase sintering. Manufacturing of Carbon – Carbon composites: Knitting, Braiding, Weaving. Properties and applications.

UNIT–IV

Manufacturing of Polymer Matrix Composites: Preparation of Moulding compounds and prepregs – hand layup method – Autoclave method – Filament winding method – Compression moulding – Reaction injection moulding. Properties and applications.

UNIT – V

Strength: Laminar Failure Criteria-strength ratio, maximum stress criteria, maximum strain criteria, interacting failure criteria, hygrothermal failure. Laminate first play failure-insight strength; Laminate strength-ply discount truncated maximum strain criterion; strength design using caplet plots; stress concentrations.

Text Books:

1. Material Science and Technology – Vol 13 – Composites by R.W.Cahn – VCH, West Germany.
2. Materials Science and Engineering, An introduction. WD Callister, Jr., Adapted by R.Balasubramaniam, John Wiley & Sons, NY, Indian edition, 2007.

CONSTRUCTION MANAGEMENT
(Open Elective)

II-M.Tech.-I-Sem. **L T P C**
Course Code: 20CEOE302 **3 0 0 3**

Course outcomes: At the end of the course, students will be able to

1. outline basic concepts of planning, strategy implementation and human resource management
2. adopt the scientific method of management for various construction projects
3. identify the different resources such as manpower, materials, cost and equipment
4. elaborate the contract document , specification and billing system
5. discuss the labour regulation, administration, accident, safety and legal issues

UNIT -I

Management process- Roles. Management theories. Social responsibilities. Planning and strategic management. Strategy implementation. Decision making: tools and techniques – Organizational structure. Human resource management- motivation performance- leadership.

UNIT-II

Classification of Construction projects, Construction stages, Resources- Functions of Construction Management and its Applications .Preliminary Planning- Collection of Data-Contract Planning – Scientific Methods of Management: Network Techniques in construction management - Bar chart, Gant chart, CPM, PERT- Cost & Time optimization.

UNIT-III

Resource planning - planning for manpower, materials, costs, equipment. Labour, -Scheduling .Forms of scheduling - Resource allocation. budget and budgetary control methods

UNIT-IV

Contract - types of contract, contract document, and specification, important conditions of contract – tender and tender document - Deposits by the contractor - Arbitration . negotiation - M.Book - Muster roll -stores.

UNIT-V

Management Information System - Labour Regulations: Social Security - welfare Legislation - Laws relating to Wages, Bonus and Industrial disputes, Labour Administration - Insurance and Safety Regulations - Workmen's Compensation Act -other labour Laws - Safety in construction: legal and financial aspects of accidents in construction. occupational and s`afety hazard assessment. Human factors in safety. Legal and financial aspects of accidents in construction. Occupational and safety hazard assessment

Reference:

1. Ghalot, P.S., Dhir, D.M., Construction Planning and Management, Wiley Eastern Limited,1992.
2. Chitkara,K.K.,Construction Project Management¸Tata McGraw Hill Publishing Co,Ltd.,New Delhi.
3. Punmia,B,C., Project Planning and Control with PERT and CPM, Laxmi Publications, New Delhi.
4. Sengupta, B. & Guha, H, Construction Management And Planning by: Tata McGraw-hill publications.

VLSI DESIGN
(Open Elective)

II-M.Tech.-I-Sem. **L T P C**
Course Code: 20ECOE303 **3 0 0 3**

Course Outcomes: Upon completion of the course, the students will be able to

1. interpret various MOS transistor fabrication techniques
2. illustrate the operation and electrical characteristics of MOS transistor
3. discuss VLSI Design flow, Stick diagrams, layout, design rules of MOS transistor
4. outline the basic concepts of MOS circuits
5. interpret scaling of MOS transistor and various levels of CMOS testing

UNIT -I
Introduction: Introduction to IC technology, Basic MOS transistors, Enhancement and depletion modes of transistor action. Fabrication process of NMOS, PMOS,CMOS and Bi-CMOS technology and comparison between CMOS and bipolar technologies.

UNIT -II
Basic Electrical properties of MOS circuits: Basic Electrical Properties of MOS and BiCMOS Circuits: Ids-Vds relationships, MOS transistor threshold Voltage, gm, gds. CMOS Inverter analysis and design, Bi-CMOSInverters.MOS Transistor conductance and output conductance, MOS transistor figure of merit, Pass transistors, nMOS inverter , Determination of pull up to pull down ratio for an nMOS inverter driven by another nMOS inverter and for an nMOS inverter driven through one or more pass transistors, Alternate forms of pull up, CMOS inverter, BiCMOS Inverters.

UNIT-III
VLSI Circuit Design Processes: VLSI Design Flow, MOS Layers, Stick Diagrams, Design Rules and Layout, 2μm CMOS Design rules for wires, Contacts and Transistors.Layout Diagrams for NMOS and CMOS Inverters and Gates, Scaling of MOS circuits.

UNIT-IV
Basic concepts of MOS Circuits: Sheet resistance, Sheet resistance concept applied to MOS transistors and inverters, Area capacitance of layers , standard unit of capacitance, some area capacitance calculations, The delay unit, inverter delays, Driving large capacitance loads, Propagation delays, wiring capacitances, Fan-in and Fan-out characteristics, Choice of layers, CMOS steady state electrical behavior, CMOS dynamic electrical behavior.
UNIT-V
Scaling of MOS Circuits: Scaling models and scaling factors, Scaling factors for device parameters, Limitations of scaling.
CMOS Testing: Need for CMOS testing, design strategies for test Manufacturing test principles, Design for testability (DFT) - Adhoc testing, Scan design, Built in self-test (BIST).

Textbooks:

1. Essentials of VLSI circuits and systems – Kamran Eshraghian, Dougles A. Pucknell, PHI, 2005.
2. CMOS VLSI Design – A Circuits and Systems Perspective, Neil H. E Weste, David Harris, Ayan Banerjee, 3rd Ed, Pearson, 2009.

References:

1. CMOS logic circuit Design - John. P. Uyemura, Springer.
2. Modern VLSI Design - Wayne Wolf, Pearson Education.

DATA MINING AND ANALYTICS
(Open Elective - I)

M.Tech. II Year-I Sem **L T P C**
Course Code: 20CSOE304 **3 0 0 3**

Course Outcomes: Upon completion of the course, the student will be able to

1. summarize fundamentals of data mining
2. illustrate various mining association rules
3. make use of classification and clustering techniques
4. outline various data analytics techniques
5. solve statistical problems using R programming

Unit-I

Introduction to Data Mining: Kinds of Data, Data mining Functionalities – Interesting Patterns Task Primitives, Issues in Data Mining, Data Preprocessing.

Unit-II

Mining Frequent, Associations and Correlations: Basic Concepts, Frequent Itemset Mining Methods:, Apriori Algorithm: Finding Frequent Itemsets by Confined Candidate Generation, Generating Association Rules from Frequent Itemsets, Improving the Efficiency of Apriori, From Association Analysis to Correlation Analysis.

Unit-III

Classification: Basic Concepts, Algorithm for Decision Tree Induction, Attribute Selection Measures. Bayes Classification Methods, Bayesian Belief Networks, a Multilayer Feed-Forward Neural Network, k-Nearest-Neighbor Classifiers.
Clustering: Cluster Analysis, Partitioning Methods: k-Means and k-Medoids, Hierarchical Methods: Agglomerative versus Divisive Hierarchical Clustering.

Unit-IV

Data Definitions and Analysis Techniques: Introduction to statistical learning and R-Programming, Elements, Variables, and Data categorization, Levels of Measurement, Data management and indexing.

Unit-V

Basic Analysis Techniques: Statistical hypothesis generation and testing, Chi-Square test, t-Test, Analysis of variance, Maximum likelihood test, regression, Practice and analysis with R.

Textbooks:

1. Data Mining- Concepts and Techniques- Jiawei Han, Micheline Kamber, Morgan Kaufmann Publishers, Elsevier, 2 Edition, 2006.
2. Introduction to Data Mining, Pang-Ning Tan, Vipin Kumar, Michael Steinbanch, Pearson Education.
3. An Introduction to Statistical Learning: with Applications in R, G James, D. Witten, T Hastie, and R. Tibshirani, Springer, 2013

References:

1. Data mining Techniques and Applications, Hongbo Du Cengage India Publishing
2. Data Mining Techniques, Arun K Pujari, 3rd Edition, Universities Press.
3. Software for Data Analysis: Programming with R (Statistics and Computing), John M. Chambers, Springer.

PROJECT – I / DISSERTATION PHASE – I

	L	T	P	C
II-M.Tech.-I-Sem.				
Course Code: 20SEPR301	**0**	**0**	**20**	**10**

Dissertation-I will have mid semester presentation and end semester presentation. Mid semester presentation will include identification of the problem based on the literature review on the topic referring to latest literature available.

End semester presentation should be done along with the report on identification of topic for the work and the methodology adopted involving scientific research, collection and analysis of data, determining solutions and must bring out individuals contribution.

Continuous assessment of Dissertation – I and Dissertation – II at Mid Sem and End Sem will be monitored by the departmental committee.

II-M.TECH.-II-SEMESTER SYLLABUS

PROJECT – II / DISSERTATION PHASE – II

	L	T	P	C
II-M.Tech.-II-Sem.				
Course Code: 20SEPR401	**0**	**0**	**32**	**16**

Dissertation – II will be an extension of the topic identified in Dissertation – I.
Continuous assessment should be done of the work done by adopting the methodology decided involving numerical analysis/ conduct experiments, collection and analysis of data, etc. There will be pre submission seminar at the end of academic term. After the approval the student has to submit the detail report and external examiner is called for the viva-voce to assess along with guide.