CMR COLLEGE OF ENGINEERING & TECHNOLOGY
(AUTONOMOUS)
DEPARTMENT OF CE

ACADEMIC REGULATION R02 FOR CBCS BASED M. TECH. (REGULAR) DEGREE PROGRAMMES

(Applicable for the students of M. Tech. programme admitted into I year from Academic Year 2015-16 and onwards)

1.0 Eligibility for Admissions

Admission to the above program shall be made subject to eligibility, qualification and specialization as prescribed by Government of Telangana State from time to time.

Admission shall be made on the basis of merit/rank obtained by the candidates at the qualifying Entrance Test conducted by the Government of Telangana or on the basis of any other order of merit as approved by the University, subject to reservations as laid down by the Government from time to time.

2.0 Award of M. Tech. degree

2.1. A student shall be declared eligible for the award of the M. Tech. Degree, if he pursues a course of study in not less than two and not more than four academic years. However, he is permitted to write the examinations for two more years after four academic years of course work, failing which he shall forfeit his seat in M.Tech programme.

2.2. The M. Tech. degree of Jawaharlal Nehru Technological University Hyderabad shall be conferred on candidates who are admitted to the program and who fulfil all the requirements for the award of the degree.

2.3 The student shall register for all 88 credits and secure all the 88 credits.

2.4 The medium of instruction and examination shall be English.

3.0 A. Courses of Study

The following specializations are offered at present for the M. Tech. course of study.

1. Embedded Systems
2. Power Electronics
3. Structural Engineering
4. Computer Science & Engineering

and any other course as approved by the College/ University/AICTE from time to time.

B. Departments offering M.Tech. programmes with specializations mentioned below:

Sl. No.	Department	M.Tech Course
1	ECE	Embedded Systems
2	EEE	Power Electronics
3	Civil	Structural Engineering
4	CSE	Computer Science & Engineering

4.0. Course Registration

4.1. A 'Faculty Advisor or Counselor' shall be assigned to each student, who will advise him about the PG Programme, its Course Structure and Curriculum, Choice/Option for Courses, based on his competence, progress, pre-requisites and interest.

4.2. Academic Section of the College invites 'Registration Forms' from students within 15 days from the commencement of class work through 'ON-LINE SUBMISSIONS', ensuring 'DATE and TIME Stamping'. The ON-LINE Registration Requests for any 'CURRENT SEMESTER' shall be completed BEFORE the commencement of SEEs (Semester End Examinations) of the 'PRECEDING SEMESTER'.

4.3. A Student can apply for ON-LINE Registration, ONLY AFTER obtaining the 'WRITTEN APPROVAL' from his Faculty Advisor, which should be submitted to the College Academic

Section through the Head of Department (a copy of the same being retained with Head of Department, Faculty Advisor and the Student).

4.4. If the Student submits ambiguous choices or multiple options or erroneous entries - during ON-LINE Registration for the Course(s) under a given/ specified Course Group/ Category as listed in the Course Structure, thereby causing discrepancy, the decision of Head of the Department shall be final.

4.5. Course Options exercised through ON-LINE Registration are final and **cannot** be changed /inter-changed; further, alternate choices will also not be considered. However, if the Course that has already been listed for Registration (by the Head of Department) in a Semester could not be offered due to any unforeseen or unexpected reasons, then the Student shall be allowed to have alternate choice - either for a new Course (subject to offering of such a Course), or for another existing Course (subject to availability of seats), which may be considered. Such alternate arrangements will be made by the Head of Department, with due notification and time-framed schedule, within the **first week** from the commencement of Class-work for that Semester.

5.0. Attendance

The programs are offered on a unit basis with each course being considered a unit.

5.1 The minimum instruction period for each semester shall be 90 clear instruction days.

5.2. A student shall be eligible to write semester end examinations of **a course** if he acquires a minimum of 75% of attendance **in that course.**

5.3. Condonation of shortage of attendance in each Course up to 10% (65% and above and below 75%) in each semester may be granted by the Institute Academic Committee on valid medical reasons.

5.4. Shortage of attendance below 65% shall not be condoned.

5.5. Students whose shortage of attendance is not condoned in any semester **for a course(s)** are not eligible to write their end

semester examination of **those** courses and their registration **for these courses** shall stand cancelled. **They have to register for these courses later when offered.**

5.6. A fee as prescribed by the Institute Academic Committee shall be payable towards condonation of shortage of attendance.

5.7. A candidate shall put in a minimum required attendance, in at least 3 theory Courses in I semester for promoting to II semester.

5.8. In order to qualify for the award of the M. Tech. Degree, the candidate shall complete all the academic requirements of the courses, as per the course structure.

5.9. A student shall not be promoted to the next semester unless he satisfies the attendance requirement of the present semester as applicable. They may re-register for the semester when offered next. If a candidate fulfils the attendance requirement in the present semester, he shall not be eligible for re-registration into the same class.

6. Evaluation

6.1. The performance of the candidate in each semester shall be evaluated Course-wise, with a maximum of 100 marks for theory and 100 marks for practicals, on the basis of Internal Evaluation and Semester End Examination.

6.2. For the theory courses 70 marks shall be awarded based on the performance in the Semester End Examination and 30 marks shall be awarded based on the Internal Evaluation. For internal evaluation there shall be the two internal examinations conducted- one in the middle of the semester and the other immediately after the completion of instruction period. Each internal examination shall be conducted for a total duration of 120 minutes. The final marks secured by the student in 'internal evaluation' for the semester are arrived at by giving a weightage of 70% to the best secured 'internal examination' and 30% weightage to the least secured 'internal examination'. A student who is absent for any internal examination for any reason what so ever shall be deemed to have secured 'zero' marks in the test/ examination and no make-up test/ examination shall be conducted.

6.3. Question paper pattern for evaluation

Internal Examination

Part A (10 Marks)

5 questions of 2 marks each (All questions are compulsory).

Part B (20 Marks)

4 questions to be answered out of 6 questions, each question carries 5 marks.

External Examination

Part A (20 Marks)

5 questions (1 question from each unit) of 4 marks each (Compulsory questions)

Part B (50 Marks)

5 questions (1 question from each unit with internal choice) each question carries 10 marks.

6.4. For practical courses, 70 marks shall be awarded based on the performance in the End Semester Examinations. 30 marks shall be awarded for day to day performance in the practicals as internal marks.

6.5. Laboratory end examination for M. Tech. courses for 70 marks must be conducted with two Examiners, one of them being the Laboratory Course Teacher and the second examiner shall be external examiner. External Examiner shall be appointed by the Controller of Examinations from other institutions or industry.

6.6. There shall be seminar presentation during I semester as well as II semester. For seminar, a student under the supervision of a faculty member, shall collect the literature on a topic and critically review the literature and submit it to the department in a report form and shall make an oral presentation before the Departmental Academic Committee consisting of Head of the Department, Supervisor and two other senior faculty members of the department. For each Seminar there will only be internal evaluation for 50 marks. A candidate has to secure for each seminar a minimum of 50% of maximum marks to be declared successful. If he fails to secure minimum marks, he has to re-appear during the supplementary examinations.

6.8. There shall be a Comprehensive Viva-Voce in III Semester. The Comprehensive Viva-Voce is intended to assess the student's understanding of various Courses during the M.Tech course of study. The Viva-Voce will be conducted by a Committee consisting of Head of the Department, two Senior Faculty members of the Department. The Comprehensive Viva-Voce is evaluated for 100 marks by the Committee. There are no internal marks for the Comprehensive Viva-Voce. A candidate has to secure a minimum of 50% of marks to be declared successful.

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

6.10. In case the candidate does not secure the minimum academic requirement in any course (as specified in 6.9) he has to reappear for the Semester End Examination in that course.

6.11. A candidate shall be given one chance to re-register for the Courses if the internal marks secured by a candidate are less than 50% and has failed in the end examination. In such a case, the candidate must re-register for the Course(s) and secure the required minimum attendance. The candidate's attendance in the re-registered Course(s) shall be calculated separately to decide upon his eligibility for writing the end examination in those Courses(s). In the event of the student taking another chance, his internal marks and end examination marks obtained in the previous attempt stand cancelled.

6.12. In case the candidate secures less than the required attendance in any course, he shall not be permitted to write the End Examination in that course. He shall re-register the course when next offered.

7. Examinations and Assessment – The Grading System

7.1 Marks will be awarded to indicate the performance of each student in each Theory Course or Lab/Practical, or Seminar, or Project, et., 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.

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

% of Marks Secured (class intervals)	Letter Grade (UGC Guidelines)	Grade Points
80% and above (≥ 80%, ≤ 100%)	**O (Outstanding)**	**10**
Below 80% but not less than 70% (≥ 70%, <80%)	**A^+ (Excellent)**	**9**
Below 70% but not less than 60% (≥ 60% , <70%)	**A (Very Good)**	**8**
Below 60% but not less than 55% (≥ 55%, <60%)	**B^+ (Good)**	**7**
Below 55% but not less than 50% (≥ 50%, < 55%)	**B (above Average)**	**6**
Below 50% (< 50%)	**F (FAIL)**	**0**
Absent	**AB**	**0**

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

7.4 A student not appeared for examination the 'AB' Grade will be allocated in any Course shall be considered 'failed' and will be required to reappear as 'Supplementary Candidate' in the Semester End Examination (SEE), as and when offered.

7.5 A Letter Grade does not imply any specific Marks percentage and it will be the range of marks percentage.

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

7.7 A student earns Grade Point (GP) in each Course, on the basis of the Letter Grade obtained by him in that Course. The corresponding 'Credit Points '(CP) are computed by multiplying, the Grade Point with Credits for that particular Courses.

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

7.8 The Student passes the Course only when he **gets GP ≥ 6 (B Grade or above)**

7.9 The Semester Grade Point Average (SGPA) is calculated by dividing the Sum of Credit Points (∑CP) secured from All 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.

SGPA = $\{ \sum_{i=1}^{N} C_i G_j \} / \{ \sum_{i=1}^{N} C_i \}$ …For each Semester.

Where 'i' is the Course indicator index (takes into account all Courses in a Semester), 'N' is the no. of Courses 'REGISTERED' for the Semester (as specifically required and listed under the Course Structure of the parent Department), C_i is the no. of Credits allotted to the i^{th} Course, and G_i represent the Grade Points (GP) corresponding to the Letter Grade awarded for that i^{th} Course.

7.10. The Cumulative Grade Point Average (CGPA) is measure of the overall cumulative performance of a student over 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, as the end of each Semester, as per the formula.

CGPA = $\{\sum_{j=1}^{M} C_j G_j\} / \{\sum_{j=1}^{M} C_j\}$ …. For all S Semester registered

{ it., upto and inclusive of S Semester, S ≥2).

Where 'M' is the TOTAL no. of Subject (as specifically required and listed under the Course Structure of the parent Department) the Student has 'REGISTERED' from the 1^{st} Semester onwards upto and inclusive of the Semester S (Obviously M > N), 'j ' is the Subject indicator index (takes into account all Courses from 1 to S Semesters),C_j is the no. of Credits allotted to the j^{th} Courses from G_j represent the Grade Points (GP) corresponding to the Letter Grade

awarded for the j^{th} Course. After registration and completion of II Semester however, the SGPA of that Semester itself may be taken as the CGPA, as there are no cumulative effects.

7.11. For Calculations listed in item 7.6 – 7.10, performance in failed Courses (securing F Grade) will also be take into account, and the credits of such Courses will also be included in the multiplications and summations.

7.12. For Calculations listed in item 7.6 – 7.10, performance in failed Courses (Securing F Grade) will also be taken into account, and the Credits of such Courses will also be included in the multiplication and summations.

8. Evaluation of Project/Dissertation Work

Every candidate shall be required to submit a thesis or dissertation on a topic approved by the Project Review Committee.

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

8.2 Registration of Project Work: A Candidate is permitted to register for the project work after satisfying the attendance requirement of all the courses, both theory and practical of I year.

8.3 After satisfying 8.2, a candidate has to submit, in consultation with his project Supervisor, the title, objective and plan of action of his project work to the PRC for approval. Only after obtaining the approval of the PRC the student can initiate the Project work.

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

8.5 A candidate shall submit his project status report in two stages at least with a gap of 3 months between them.

8.6 The work on the project shall be initiated at the beginning of the III semester and the duration of the project is two semesters. A

candidate is permitted to submit Project Thesis only after successful completion of all theory and practical courses with the approval of PRC not earlier than 40 weeks from the date of registration of the project work. For the approval of PRC the candidate shall submit the draft copy of thesis to the Head of the Department and make an oral presentation before the PRC.

8.7 After approval from the PRC, the soft copy of the thesis should be submitted to the College for ANTI-PLAGIARISM check and the plagiarism report should be included in the final thesis. If the result of above check is less than 24%, then only thesis will be accepted for submission.

8.8. Three copies of the Project Thesis certified by the supervisor shall be submitted to the College.

8.9 For Project Work Review-I will be conducted in III Semester and carries a maximum internal marks of 50. The evaluation should be done by the PRC for 25 marks and Project Supervisor for 25 marks. The Supervisor and PRC will examine the Literature Survey in the same domain, Problem Definition, Objective, Scope of Work**.** A candidate has to secure a minimum of 50% of marks to be declared successful in Project Work Review I. If he fails to secure minimum required marks he has to reappear during the supplementary examination.

8.10. Project Work Review II in IV Semester carries 50 internal marks. The evaluation should be done by the PRC for 25 marks and the Project Supervisor for 25 marks. The PRC will examine the overall progress of the Project Work and decide the eligibility of the Project for final submission. A candidate has to secure a minimum of 50% of marks to be declared successful in Project Work Review II. If he fails to fulfill minimum marks, he has to reappear for Review-II during the supplementary examination.

8.11 The thesis shall be adjudicated by the committee consisting of one senior faculty selected by the Head of the Department, the guide concerned, Head of the Department and external examiner.

8.12 If the report of the committee is not favourable, the candidate shall revise and resubmit the Thesis. If the report of the committee is unfavourable again, the thesis shall be summarily rejected.

8.13. For Project Work Evaluation (Viva Voice) will be conducted on acceptance of the Thesis in IV Semester. This is an external

evaluation for 150 marks and will be evaluated by the committee. The External Examiner for the committee shall be appointed by the Controller of Examinations. The candidate has to secure minimum of 50% marks in Project Evaluation (Viva Voice) examination for its successful completion.

8.14. If he fails to secure minimum marks as specified in 8.13, he will reappear for the Viva Voice examination only after three months. In the reappeared examination also if the candidate fails to secure minimum prescribed marks the registration for the programme stands cancelled and he will not be eligible for the award of the degree.

8.15. The Head of the Department shall coordinate and make arrangements for the conduct of Project Viva Voice examination.

9. Award of Degree and Class

9.1 A Student who registers for all the specified Courses as listed in the Course Structure, satisfies all the Course Requirements, and passes the examinations prescribed in the entire PG Programme (PGP), and secured the required number of **88** Credits (with CGPA ≥ 6.0), shall be declared to have 'QUALIFIED' for the award of the M.Tech. Degree in the chosen Branch of Engineering and Technology, with the specialization for which he took admission.

9.2 Award of Class

After a student has satisfied the requirements prescribed for the completion of the programme, becomes eligible for the award of M.Tech. Degree, he shall be placed in one of the following three classes based on the CGPA.

Class Awarded	CGPA
First Class and Distinction	**≥ 7.75**
First Class	**6.75 ≤ CGPA > 7.75**
Second Class	**6.00 ≤ CGPA < 6.75**

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

10. Withholding of Results

If the student has not paid the dues, if any, to the institution or if any case of indiscipline is pending against him, the result of the student will be withheld and he will not be allowed into the next semester.

11. General

11.1. Wherever the words "he", "him", "his", occur in the regulations, they include "she", "her", "hers".

11.2. The academic regulation should be read as a whole for the purpose of any interpretation.

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

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

MALPRACTICES RULES
DISCIPLINARY ACTION FOR
IMPROPER CONDUCT IN EXAMINATIONS

	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.
(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 Courses the candidate has already appeared including practical examinations and project work and shall not be permitted to appear for the remaining examinations of the Courses of that Semester/year. The Hall Ticket of the candidate is to be cancelled.
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 Courses of the examination (including practicals and project work) already appeared and shall not be allowed to appear for examinations of the Remaining Courses of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all end semester 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 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 Courses the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the Courses of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all end semester 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 Chief Superintendent/Assistant–Superintendent / any officer on duty or misbehaves or creates disturbance of any kind in and around the college or organizes a walk out or	In case of students of the college, they shall be expelled from examination halls and cancellation of their performance in that subject and all other Courses the candidate(s) has (have) already appeared and shall not be permitted to appear for the remaining examinations of the

	instigates others **to** examination hall walk out, or threatens the officer- in-charge or any person on duty in or outside the examination hall of any injury**,** to his person or to any of his relations whether by words, either spoken or written or by signs or by visible representation, assaults the officer- in-charge, or any person on duty in or outside the examination hall or any of his relations, or indulges in any other act of misconduct or mischief which result in damage to or destruction 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.	Courses of that semester/year. The candidates are also 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 Courses the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the Courses of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all University examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat.
8.	Possess any lethal weapon or	Expulsion from the examination hall and

	firearm in the examination hall.	cancellation of the performance in that subject and all other Courses the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the Courses 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.	If the student belongs to the college, expulsion from the examination hall an cancellation of performance in that subject and all other Courses hall and all other Courses that candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the Courses 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 Courses the candidate has already appeared including practical examinations and project work and shall not be permitted for other remaining examinations of the Courses 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 Courses the candidate has appeared including practical examinations and project work of that semester/year.
12.	If any malpractice is detected which is not covered in the above clauses 1 to 11 shall be reported to the College Academic Committee for further action to award suitable punishment.	

Malpractices identified by squad or special invigilators

Punishments to the candidates as per the above guidelines.

Malpractice identified at Spot center during valuation

The following procedure is to be followed in case of malpractice cases detected during valuation, scrutiny etc. at spot center.

1) Malpractice is detected at the spot valuation. The case is to be referred to the malpractice committee. Malpractice committee will meet and discuss/question the candidate and based on the evidences, the committee will recommend suitable action on the candidate.
2) A notice is to be served to the candidate(s) involved through the Principal to his address and to the candidate(s) permanent address regarding the malpractice and seek explanations.

3) The involvement of staff who are in charge of conducting examinations, invigilators valuing examination papers and preparing / keeping records of documents relating to the examinations in such acts (inclusive of providing incorrect or misleading information) that infringe upon the course of natural justice to one and all concerned at the examinations shall be viewed seriously and recommended for award of appropriate punishment after thorough enquiry.

4) Based on the explanation and recommendation of the committee, action may be initiated.

5) Malpractice committee:

i.	Controller of Examinations	Chairman
ii.	Assistant controller of Evaluation	Member
iii.	Chief Examiner of the subject/ subject expert	Member
iv.	Concerned Head of the Department	Member
v.	Concerned Invigilator	Member

DEPARTMENT OF CIVIL ENGINEERING

COURSE STRUCTURE FOR CBCS BASED M.TECH (STRUCTURAL ENGINEERING) R-02

EFFECTIVE FROM AC YEAR 2015-16

I Semester

CODE	Group	Title	L	P	C
B2401	CC	Advanced Reinforced Concrete Design	4	--	4
B2402	CC	Theory of Elasticity & Plasticity	4	--	4
B2402	CC	Theory and Analysis of and Plates	4	--	4
	PE	Professional Elective –I	4	--	4
	PE	Professional Elective –II	4	--	4
	OE	Open Elective –I	4	--	4
B2412	CC	Advanced Concrete Laboratory	--	4	2
B2414	PW	Seminar	--	4	2
TOTAL			24	8	**28**

II Semester

CODE	Group	Title	L	P	C
B2415	CC	Finite Element Methods	4	--	4
B2416	CC	Structural Dynamics	4	--	4
B2417	CC	Advanced Steel Design	4	--	4
	PE	Professional Elective –III	4	--	4
	PE	Professional Elective –IV	4	--	4
	OE	Open Elective –II	4	--	4
B2427	CC	CAD Laboratory	--	4	2
B2428	PW	Seminar	--	4	2
TOTAL			24	8	**28**

III Semester

CODE	Group	Title	L	P	C
B2429	PW	Comprehensive Viva-Voce	--	--	4
B2420A	PW	Project Work (Review I)	--	24	12
		TOTAL			**16**

IV Semester

CODE	Group	Title	L	P	C
B2420B	PW	Project Work (Review II)	--	8	4
B2420C	PW	Project Work (Viva-Voce)	--	16	12
		TOTAL			**16**

S. No	Code	Name of Subject
Professional Elective –I		
1	B2404	Earthquake Resistant Design of Buildings
2	B2405	Stability of Structures
2	B2406	Plastic Analysis and Design
Professional Elective –II		
1	B2407	Advanced Structural Analysis
2	B2408	Soil Dynamics & Machine Foundations
2	B2409	Composite Materials.
Open Elective-I		
1	B2410	Computer Oriented Numerical Methods
2	B2411	Non-Destructive Testing
2	B2412	Reliability based structural design
Professional Elective –III		
1	B2418	Pre-Stressed Concrete.
2	B2419	Advanced Foundation Engineering
2	B2420	Green Buildings
Professional Elective –IV		
1	B2421	Design of Shell & Folded Plates Structures
2	B2422	Bridge Engineering
2	B2422	Experimental Stress Analysis
Open Elective-II		
1	B2424	Optimization Techniques in Structural Engineering
2	B2425	Advanced Concrete Technology
2	B2426	Computer Aided Design in Structural Engg (CAD)

S.No	Category
CC	Core Course
PE	Professional Elective
OE	Open Elective
PW	Project Work, Seminar

DETAILED SYLLABUS

(B2401) ADVANCED REINFORCED CONCRETE DESIGN

M.Tech (SE)-I Semester **L T P C 4004**

UNIT I

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.

UNIT II

Design of Ribbed slabs, Flat 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.

UNIT III

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 IV

Design of Shear walls: Classification according to Behaviour, Loads in Shear walls, Design of Rectangular and Flanged Shear walls, Derivation of Formula for Moment of Resistance of Rectangular Shear walls.

UNIT V

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, shrinkage and thermal cracking.

Text Books

1. Reinforced concrete design by S. Unnikrishna Pillai & Menon, Tata Mc. Graw Hill, 2nd Edition, 2004
2. Advanced Reinforced Concrete Design – P.C. Varghese, Practice Hall, 2008
3. Limit state theory and design of reinforced concrete by Dr. S.R. Karve and Dr. V.L. Shah, Standard publishers, Pune, 2rd Edition, 1994

Reference Books

1. Reinforced concrete design by Kennath Leet, Tata Mc. Graw-Hill International, editions, 2nd edition, 1991.
2. Reinforced concrete structural elements – behaviour, Analysis and design by P. Purushotham, Tata Mc.Graw-Hill, 1994.
3. Design of concrete structures – Arthus H. Nilson, David Darwin, and Chorles W. Dolar, Tata Mc. Graw-Hill, 2rd Edition, 2005. 550
4. Reinforced concrete structures, Vol.1, by B.C. Punmia, Ashok Kumar
5. Reinforced concrete structures – I.C. Syal & A.K. Goel, S. Chand,

(B2402) THEORY OF ELASTICITY AND PLASTICITY

M.Tech (SE)-I Semester	L	T	P	C
	4	0	0	4

UNIT-I

Introduction: Elasticity - notation for forces and stress - components of stresses - components of strain - Hooks law. Plane stress and plane strain analysis - plane stress - plane strain - differential equations of equilibrium - boundary conditions - compatibility equations - stress function - boundary condition.

UNIT II.

Two dimensional problems in rectangular coordinates - solution by polynomials - Saint- Venants principle - determination of displacements - bending of simple beams - application of Fourier series for two dimensional problems - gravity loading. 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 - simple symmetric and asymmetric problems - general solution of two- dimensional problem in polar coordinates - application of general solution in polar coordinates.

UNIT III.

Analysis of stress and strain in three dimensions - principal stress - stress ellipsoid - director surface - determination of principal stresses - 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.

UNIT IV.

Torsion of Prismatic Bars - torsion of prismatic bars - bars with elliptical cross sections - other elementary solution - membrane analogy - torsion of rectangular bars - solution of torsional problems by energy method - use of soap films in solving torsion problems - hydro dynamical analogies - torsion of shafts, tubes , bars etc. Bending of Prismatic Bars: Stress function - bending of cantilever - circular cross section - elliptical cross section - rectangular cross section - bending problems by soap film method - displacements.

UNIT V

Theory of Plasticity: Introduction - concepts and assumptions - yield criterions.

References

1. Theory of Elasticity by Timeshanko, McGrawhill Publications.
2. Theory of Plasticity by J.Chakarbarthy, McGrawhill Publications
3. Theory of Elasticity by Y.C.Fung.
4. Theory of Elasticity by Gurucharan Singh .

(B2402) THEORY AND ANALYSIS OF PLATES

M.Tech (SE)-I Semester	L	T	P	C
	4	0	0	4

UNIT I

Cylindrical Bending: Different kind of plates – Assumptions - Derivation of differential equation for cylindrical bending of long rectangular plates - Analysis of uniformly loaded rectangular plates with edges simply supported and fixed subjected to uniform load.

Pure Bending of Plates: Slope and curvature of slightly bent plates – Relations between moments and curvature - Particular cases of pure bending - Strain energy in pure bending –Energy methods like Ritz and Galerkin Methods to rectangular plates subjected to simple loadings.

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: Symmetrical loading – Relations between slope, deflection, moments and curvature – Governing differential equation – Uniformly loaded plates with clamped and simply supported edges – Central hole – bending by moments and shearing forces uniformly distributed.

Orthotropic Plates: Introduction – Bending of anisotropic plates - Derivation of governing differential equation – Determination of Rigidities in various cases like R.C. slabs, corrugated sheet – Application to the theory of gridworks.

UNIT IV

Plates on Elastic Foundations: Governing differential equation – deflection of uniformly loaded simply supported rectangular plate – Navier and Levy type solutions - Large plate loaded at equidistant points by concentrated forces P.

UNIT V

Buckling of Plates: Governing equation for Bending of plate under the combined action of in-plane loading and lateral loads – Buckling of rectangular plates by compressive forces acting in one and two directions in the middle plane of plate

Finite Difference Methods: Introduction - Application to rectangular plates subjected to simple loading.

References

1. Theory of Plates and Shells by Timoshenko, McGraw Hill Book Co., New York
1. Theory and Analysis of Plates by P. Szilard, Prentice Hall
3. Theory of Plates by Chandrasekhar, University Press.
4. Plate Analysis by N. K. Bairagi, Khanna Publishers. New Delhi

(B2404) EARTHQUAKE RESISTANT DESIGN OF BUILDINGS
(Professional Elective - I)

M.Tech (SE)-I Semester	**L**	**T**	**P**	**C**
	4	**0**	**0**	**4**

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.

UNIT - II
Conceptual design: Introduction-Functional planning-Continuous load path-Overall form-simplicity and symmetry-elongated shapes-stiffness and strength-Horizontal and Vertical members-Twisting of buildings-Ductility-definition-ductility relationships-flexible buildings-framing systems-choice of construction materials-unconfined concrete-confined concrete-masonry-reinforcing steel. Introduction to earthquake resistant design: Seismic design requirements-regular and irregular configurations-basic assumptions-design earthquake loads-basic load combinations-permissible stresses-seismic methods of analysis-factors in seismic analysis-equivalent lateral force method-dynamic analysis-response spectrum method-Time history method.

UNIT - III
Reinforced Concrete Buildings: Principles of earthquake resistant deign of RC members- Structural models for frame buildings- Seismic methods of analysis- Seismic deign methods- IS code based methods for seismic design- Seismic evaluation and retrofitting- Vertical irregularities- Plan configuration problems- Lateral load resisting systems- Determination of design lateral forces- Equivalent lateral force procedure- Lateral distribution of base shear. Masonry Buildings: Introduction- Elastic properties of masonry assemblage- Categories of masonry buildings-Behaviour of unreinforced and reinforced masonry walls- Behaviour of walls- Box action and bands- Behaviour of infill walls- Improving seismic behaviour of masonry buildings- Load combinations and permissible stresses- Seismic design requirements- Lateral load analysis of masonry buildings.

UNIT - IV

Structural Walls and Non-Structural Elements: Strategies in the location of structural walls- sectional shapes- variations in elevation- cantilever walls without openings – Failure mechanism of non-structures- Effects of non-structural elements on structural system- Analysis of non-structural elements- Prevention of non-structural damage- Isolation of non-structures.

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 12920. Behaviour of beams, columns and joints in RC buildings during earthquakes-Vulnerability of open ground storey and short columns during earthquakes.

Capacity Based Design: Introduction to Capacity Design, Capacity Design for Beams and Columns-Case studies.

Reference Books

1. Earthquake Resistant Design of structures – S. K. Duggal, Oxford University Press
2. Earthquake Resistant Design of structures – Pankaj Agarwal and Manish Shrikhande, Prentice Hall of India Pvt. Ltd.
3. Seismic Design of Reinforced Concrete and Masonry Building – T. Paulay and M.J.N. Priestly, John Wiley & Sons
4. Masory and Timber structures including earthquake Resistant Design –Anand S.Arya, Nem chand & Brosop
5. Earthquake –Resistant Design of Masonry Building –Miha Tomazevic, Imperial college Press.
6. Earthquake Tips – Learning Earthquake Design and Construction C.V.R. Murty

Reference Codes: Direct From ISI

1. IS: 1892 (Part-1) -2002. “Criteria for Earthquake Resistant – Design of structures.” B.I.S., New Delhi.
2. IS:4226-1992, “ Earthquake Resistant Design and Construction of Building”, Code of Practice B.I.S., New Delhi.
3. IS:12920-1992, “ Ductile detailing of concrete structures subjected to seismic force” – Guidelines, B.I.S., New Delhi.

(B2405) STABILITY OF STRUCTURES

(Professional Elective - I)

M.Tech (SE)-I Semester	L	T	P	C
	4	0	0	4

UNIT – I

Beam Columns: Differential equations for beam columns- beam columns with concentrated loads – continuous lateral loads-couples- beam columns with built in ends – continuous beams with axial load – application of trigonometrically series – Effects of initial curvature on deflections – Determination of allowable stresses.

UNIT - II

Elastic Buckling of bars and frames: Elastic Buckling of straight columns – Effect of shear stress on buckling – Eccentrically and laterally loaded columns- Buckling of frames-large deflections of buckled bars-Energy methods- Buckling of bars on elastic foundations- Buckle line of bar with intermediate compressive forces - Buckling of bars with change in cross-section – Effect of shear force on critical load- built up columns.

UNIT - III

In Elastic Buckling: Buckle line of straight bar- Double modulus theory – Tangent modulus theory, Inelastic lateral Buckling. Experiments and design formulae: Experiments on columns – Critical stress diagram – Empirical formulae for design – various end conditions

UNIT - IV

Torsion Buckling: Pure torsion of thin walled bars of open cross section – Non-uniform torsion of thin walled bars of open cross section-Torsional buckling – Buckling by torsion and flexure.

UNIT – V

Lateral buckling of simply supported Beams: Beams of Rectangular cross-section subjected to pure bending. Buckling of simply supported Rectangular plates: Derivation of equation of plate subjected to constant compression in one and two directions.

References

1. Theory of elastic Stability by Timshenko & Gere-Mc Graw Hill
2. Stability of metallic structures by Blunch- Mc Graw Hill
3. Theory of Beam- Columns Vol I by Chem. & Atste Mc. Graw Hill

(B2406) PLASTIC ANALYSIS AND DESIGN

(Professional Elective -I)

M.Tech (SE)-I Semester	L	T	P	C
	4	0	0	4

UNIT – I

Analysis of Structures for Ultimate Load: Fundamental Principles – statical method of Analysis – Mechanism method of analysis – Method of analysis, Moment check – Carry over factor – Moment Balancing Method.

UNIT - II

Design of Continuous Beams: Continuous Beams of uniform section throughout – Continuous Beams with different cross-sections.

UNIT - III

Secondary Design Problems: Introduction – Influence of Axial force on the plastic moment – influence of shear force – local buckling of flanges and webs – lateral buckling – column stability.

UNIT - IV

Design of Connections: Introduction – requirement for connections – straight corner connections – Haunched connection – Interior Beam-Column connections.

UNIT - V

Design of Steel Frames: Introduction – Sinole span frames – simplified procedures for Sinole span frames – Design of Gable frames with Haunched Connection. Ultimate Deflections: Introduction – Deflection at ultimate load – Deflection at working load – Deflections of Beams and Sinole span frames.

References

1. Plastic Design of Steel Frames, L.S.Beedle.
2. Plastic Analysis, B.G.Neal
3. Plastic Analysis, Horve

(B2407) ADVANCED STRUCTURAL ANALYSIS

(Professional Elective -II)

M.Tech (SE)-I Semester	L	T	P	C
	4	0	0	4

UNIT I

Introduction to matrix methods of analysis - statically indeterminacy and kinematics 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 tensional 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 - bank matrix - semi bandwidth - computer algorithm for assembly by direct stiffness matrix method.

UNIT III

Analysis of plane truss - continuous beam - plane frame and grids by flexibility methods.

UNIT IV

Analysis of plane truss - continuous beam - plane frame and grids by stiffness methods.

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

Shear walls- Necessity - structural behaviour of large frames with and without shear walls - approximate methods of analysis of shear walls.

References

1. Matrix Analysis of Frames structures by William Weaver J.R and James M.Geve, CBS publications.
2. Advanced Structural Analysis by Ashok.K.Jain, New Channel Brothers.
3. Structural Analysis by C.S.Reddy.

4. Matrix Structural Analysis by Kanchi. Matrix Methods of Structural Analysis by J.Meek
5. Structural Analysis by Ghali and Neyveli.

(B2408) SOIL DYNAMICS AND FOUNDATION ENGINEERING

(Professional Elective -II)

M.Tech (SE)-I Semester	**L**	**T**	**P**	**C**
	4	**0**	**0**	**4**

UNIT I

Types of machine foundations – general requirements design – criteria for machine foundations, permissible amplitudes and bearing pressure. Resonance and its effect – free and forced Vibrations with and without damping – constant force and rotating mass type excitation – magnification steady state vibrations – logarithmic decrement.

UNIT II

Natural frequency of foundation – soil system – Barkan's and I.S. methods of determining natural frequency.

UNIT III

Elastic properties of soil for dynamical purpose and their experimental determination – Elastic waves and their characteristics – Experimental determination of shear modulus from wave theory.

UNIT IV

Apparent soil mass – bulb of pressure concept – Pauw's analogy of foundation – soil systems (Concept only) - Theory of elastic half space – lamb and the dynamic Boussinesq's problem – Relsner's solution and its limitations – Quinlan and Sung's modifications – Hsiegh's equations for vertical vibration.

UNIT V

Principles of design of foundations for reciprocating and impact type of machine – as per I.S. Codes. Vibration isolation – types and methods of isolation – isolating materials and their properties.

References

1. Hand Book of Machine Foundations by S. Srinivasulu and Vaidganathan
2. Soil Mechanics & Foundation Engineering by B.C. Punmia.
3. Analysis and Design of Foundation and retaining structures-Sham Sher Prakets, Etal
4. Vibration of Soils & Foundations – Richant Hall & Woods.

(B2409) COMPOSITE MATERIALS

(Professional Elective -II)

M.Tech (SE)-I Semester	**L**	**T**	**P**	**C**
	4	**0**	**0**	**4**

UNIT - I

Introduction: Requirements of structural materials, influence of nature of materials in structural form, Nature of structural materials- Homogeneous materials, composite materials.

UNIT - II

Macro mechanical Properties of composite Laminae: Introduction, Assumptions and Idealizations, Stress Strain relationships for composite Laminae- Isotropic, Orthotropic laminae, Strength Characteristics- Basic concepts, Strength hypothesis for isotropic and Orthotropic laminae. Macro mechanical Analysis of composite Laminae: Introduction, Assumptions and Limitations, Stiffness characteristics of glass reinforced laminae- Stress- Strain relationships in continuous, discontinuous fibre laminae, Strength characteristics of glass reinforced laminae- Strengths in continuous, discontinuous fibre laminae.

UNIT - III

Behaviour of Glass Fibre-Reinforced laminates: Introduction, Stiffness characteristics of Laminated composites-Behaviour of Laminated beams and plates, Strength characteristics of Laminated composites- Strength analysis and failure criteria, Effect of inter laminar structures. Glass Reinforced Composites: Introduction, Continuously reinforced laminates- uni-directionally and multi directionally continuously reinforced laminates, Discontinuously reinforced laminates – Stiffness and Strength properties.

UNIT - IV

GRP properties relevant to structural Design: Introduction, Short-term strength and stiffness-Tensile, Compressive, Flexural and Shearing. Long term strength and stiffness properties, Temperature effects, Effect of fire, Structural joints- Adhesive, mechanical, Combinational, Transformed sections.

UNIT - V

Design of GRP Box Beams: Introduction, loading, span and cross-sectional shape, Selection of material, Beam manufacture, Beam stresses, Experimental Behaviour, Effect on Beam performance- Modulus of Elasticity, Compressive Strength, I value, prevention of compression buckling failure, Behaviour under long term loading.

Design of Stressed skinned roof structure: Introduction, loading and material properties, preliminary design, and computer analysis.

References

1. GRP in Structural Engineering M.Holmes and D.J.Just.
2. Mechanics of Composite materials and Structures by Manjunath Mukhopadhyay; Universities Press

(B2410) COMPUTER ORIENTED NUMERICAL METHODS
(Open Elective-I)

M.Tech (SE)-I Semester	**L**	**T**	**P**	**C**
	4	**0**	**0**	**4**

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

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.

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
2. Numerical methods by S.S.Shastry.1995
3. Applied numerical analysis by – Curtis I.Gerala- Addission Wasley
4. Numerical methods for Engineers Stevan C.Chopra, Raymond P.Canal Mc. Graw Hill book company
5. C Language and Numerical methods by C.Xavier – New age international publisher.
6. Computer based numerical analysis by Dr. M.Shanta Kumar, Khanna Book publishers, New Delhi.

(B2411) NON DESTRUCTIVE TESTING

(Open Elective-I)

M.Tech (SE)-I Semester	**L**	**T**	**P**	**C**
	4	**0**	**0**	**4**

UNIT I - Visual Inspection and Eddy Current Testing

Scope and advantages of NDT, Comparison of NDT with DT, classifications of NDT Visual InspectionEquipment used for visual inspection -Magnifying Glass Magnifying Mirror, Microscope Borescope , endoscopes or endoprobes Flexible Fiber Optic Borescope , Video Imagescope .Eddy Current Testing- Principle, Advantages, Disadvantages Factors Affecting Eddy Current Response-Material Conductivity Permeability - Frequency- Geometry-Proximity (Lift off)-Typical Applications, limitations ,Types of Probes.

UNIT II - Liquid Penetrant Testing

Liquid penetration testing- Introduction, Principle, Equipment, Procedures, Characteristics of penetrants- developers - Evaluation - hazards Precautions, advantages, limitations and applications.

UNIT III - Magnetic Particle Testing

Principle of Magnetic Particle Testing-different methods to generate magnetic fields -Magnetic Particle Testing Equipment- Magnetic Particle Testing Procedures Method of De-Magnetization- Magnetic Particle Medium-Evaluation of Indications and Acceptance Standards- magnetic particle test- applications, advantages and limitations.

UNIT IV - Radiographic Testing

X-ray radiography principle, equipment & methodology - Type of Industrial Radiation sources and Application-Radiographic exposure Factors and Technique- GAMA Ray and X-Ray Equipment- Radiographic Procedure - Radiograph Interpretation, Radiography Image Quality Indicators-Radiographic Techniques- Film Processing-Methods of Viewing Radiographs-Radiographic Testing Procedures for welds. Precautions against radiation hazards.

UNIT V - Ultrasonic Testing

Introduction, Principle of operation Type of Ultrasonic Propagation-Ultrasonic probes. Types of Transducers -Ultrasonic Testing Techniques. Method for Evaluating Discontinuities-Ultrasonic Testing Procedures for

different component -applications, advantages and limitations, Documentation, . Applications in inspection of castings, forgings, Extruded steel parts, bars, pipes, rails and dimensions measurements.

Text Books

1. American Metals Society, "Non-Destructive Examination and Quality Control", Metals Hand Book, Vol.17, 9th Ed, Metals Park, OH, 1989.
2. Bray, Don.E and Stanley, Roderic.K, "Nondestructive Evaluation: A Tool in Design, Manufacturing, and Service. Revised", CRC Press New York, Edition 1997.

References

1. www.ndt-ed.org
2. www.krautkramer.com.au

(B2412) RELIABILITY BASED STRUCTURAL DESIGN
(Open Elective-I)

M.Tech (SE)-I Semester	**L**	**T**	**P**	**C**
	4	**0**	**0**	**4**

UNIT I
Basic Concepts of Reliability: Introduction, Reliability and Quality, Failures and Failure Modes, Causes of Failures and Unreliability, Maintainability and Availability, History of Reliability, Reliability Literature.

UNIT II
Design for Reliability: Constraints and Considerations: Reliability Analysis, Mathematical Models and Numerical Evaluation, Designing for Higher Reliability, Redundancy Techniques, Equipment Hierarchy, Reliability and Cost.

UNIT III
Discrete Distributions: Density and distributions, Continuous Distributions, Numerical Characteristics of Random Variables, Laplace Transform.

UNIT-IV
Maintainability and Availability Concepts : Introduction, Maintainability Function, Availability Function, Frequency of Failure, Two-unit parallel system with Repair, K-out-of M systems, Preventive Maintenance .

UNIT-V
Hierarchical Systems: Introduction, Logic Diagram Approach, Conditional Probability Approach, System Cost, Illustrations and Discussions, Reliability Approximations.

Text Books
1. Reliability Engineering by E. Balagurusamy, McGraw Hill Education(India) Pvt. Ltd.
2. Reliability Evaluation of Engineering Systems by Roy Billinton & Ronald N. Allan, Springer.
3. Reliability of Structures, Second Edition by Andrzej S. Nowak, Kevin R. Collins December 20, 2012 by CRC Press

(B2412) ADVANCED CONCRETE LABORATORY

M.Tech (SE)-I Semester	L	T	P	C
	0	0	4	2

1. Tests on cement -Consistency, Setting times, Soundness, Compressive Strength.
2. Gradation Charts of Aggregates.
3. Bulking of fine Aggregate.
4. Aggregate Crushing and Impact value
5. Workability Test on Fresh concrete
6. Air Entrainment Test.
7. Creep and Shrinkage.
8. Permeability of Concrete.
9. Non Destructive Testing of Concrete.
10. Accelerated Curing of Concrete.
11. Rebar location in Hardened Concrete.

(B2415) FINITE ELEMENT METHODS

M.Tech (SE)-II Semester	L	T	P	C
	4	0	0	4

UNIT I

Introduction: Concepts of FEM - steps involved - merits and demerits - energy principles – discrimination Raleigh - Ritz method of functional approximation. Principles of Elasticity: Stress equations - strain displacement relationships in matrix form plane stress, plane strain and axi-symmetric bodies of revolution with axi-symmetric loading.

UNIT II

One dimensional FEM: Stiffness matrix for beam and bar elements - shape functions foe ID elements. Two dimensional FEM: Different types of elements for plane stress and plane strain analysis - displacement models - generalized coordinates - shape functions - convergent and compatibility requirements - geometric invariance - natural coordinate system - area and volume coordinates - generation of element stiffness and nodal load matrices

UNIT III

Isoparametric formulation: Concept - different isoparametric elements for 2D analysis -formulation of 4-noded and 8-noded isoparametric quadrilateral elements - Lagrange elements - serendipity elements.

Axi Symmetric Analysis: bodies of revolution - axi symmetric modeling - strain displacement relationship - formulation of axi symmetric elements. Three dimensional FEM: Different 2-D elements-strain-displacement relationship – formulation of hexahedral and isoparametric solid element.

UNIT IV

Introduction to Finite Element Analysis of Plates: basic theory of plate plate bending - thin plate theory - stress resultants - Mindlin's approximations - formulation of 4-noded isoperimetric quadrilateral plate element – Shell Element.

UNIT V

Introduction to non – linear analysis – basic methods – application to Special structures.

References

1. Concepts and Applications of Finite Element Analysis by Robert D.Cook, David S. Malkus and Michael E. Plesha, John Wiley & Sons.
2. Finite element Methods by OC Zienkiewicz
3. Finite element analysis, theory and progarmming by GS Krishna Murthy.
4. Introduction to Finite element Method by Tirupathi Chandra Patila and Belugunudu
5. Introduction to Finite element Method by JN Reddy

(B2416) STRUCTURAL DYNAMICS

M.Tech (SE)-II Semester	L	T	P	C
	4	0	0	4

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 -Dynamic magnification factor – Phase angle – Bandwidth

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: Introduction - Excitation by rigid base translation - Lumped mass approach - SDOF and MDOF systems - I. S. Code methods of analysis for obtaining response of multi storeyed buildings.

References

1. Dynamics of Structures by Clough & Penzien, McGraw Hill, New York o p
2. Structural Dynamics by Mario Paz, C.B.S Publishers, New Delhi. 750
3. Dynamics of Structures by Anil K. Chopra, Pearson Education (Singapore), Delhi
4. I.S: 1892 - 1984, "Code of practice for Earthquake resistant design of Structures" and latest I.S: 1892 - 2002 (version) Part-1

(B2417) ADVANCED STEEL DESIGN

M.Tech (SE)-II Semester	L	T	P	C
	4	0	0	4

ELASTIC DESIGN:

UNIT I

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 II

Analysis of Multi Storey Frames: under lateral loading using approximate methods such as cantilever method, portal method and factor method.

Space Frames: Types of space structures; materials used in space frames: Advantage and disadvantages practical difficulties; analysis and design of towers;

UNIT III

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.

PLASTIC DESIGN:

UNIT IV

Analysis of Structures for Ultimate Load: Introduction: fundamentals static method of analysis and mechanism method of analysis; applications to the cases of rectangular portal frames. Gable frames, inclined frames using instantaneous centre method., methods for performing moment check, trial and error method, moment balancing method.

UNIT V

Ultimate Deflections: Deflections at ultimate load, applications to cases of beams and frames. Principles of optimization in structural design. Application to some simple cases – minimum weight design.

References

1. Design of Steel Structures. P.Dayaratnam
2. Design Steel Structures by Gaylord and Gaylord
3. Structural Engineer's Hand Book by Merrit
4. Plastic Analysis of structures by B.G.Neal op
5. Design of steel structures by Vazirani and Ratwani
6. Design of steel structures. Vol.II by Dr. RAmachandra
7. Structural Design & Drawing by N. Krishna Raju
8. Plastic Design by Beedal.
9. Design of steel Structures by B.C. Punmia

(B2418) PRE-STRESSED CONCRETE

(Professional Elective -III)

M.Tech (SE)-II Semester	**L**	**T**	**P**	**C**
	4	**0**	**0**	**4**

UNIT I

General Principles of Prestressed Concrete : Pre–tensioning and post – tensioning – Prestressing by straight, concentric, eccentric, bent and parabolic tendons – Different methods and systems of prestressing like Hoyer system, Freyssinet system, Magnel Blaton system – Lee-Mc call system.

Losses of Prestress: Loss of prestress in pre-tensioned and post-tensioned members due to various causes like elastic shortening of concrete, shrinkage of concrete, creep of concrete, relaxation of steel, slip in anchorage, bending of member and frictional loss – Analysis of sections for flexure.

UNIT II

Design of Section for Flexure: Allowable stresses – Elastic design of simple beams having rectangular and I-section for flexure – kern lines – cable profile and cable layout. **Design of Sections for Shear :** Shear and Principal stresses – Improving shear resistance by different prestressing techniques – horizontal, sloping and vertical prestressing – Analysis of rectangular and I–beam – Design of shear reinforcement – Indian code provisions.

UNIT III

Deflections of Prestressed Concrete Beams: Short term deflections of uncracked members– Prediction of long-time deflections – load – deflection curve for a PSC beam – IS code requirements for max. deflections.

UNIT IV

Transfer of Prestress in Pretensioned Members: Transmission of prestressing force by bond – Transmission length – Flexural bond stresses – IS code provisions – Anchorage zone stresses in post tensioned members – stress distribution in End block –

Analysis by approximate, Guyon and Magnel methods – Anchorage zone reinforcement.

UNIT V

Statically Indeterminate Structures : Advantages & disadvantages of continuous PSC beams – Primary and secondary moments – P and C lines – Linear transformation concordant and non-concordant cable profiles – Analysis of continuous beams and simple portal frames (single bay and single story)

References

1. Prestressed concrete by Krishna Raju Tata Mc Graw Hill Book – Co ., New Delhi.
2. Design of prestress concrete structures by T.Y. Lin and Burn, John Wiley, New York.
3. Prestressed concrete by S. Ramamrutham Dhanpat Rai & Sons, Delhi.

(B2419) ADVANCED FOUNDATION ENGINEERING

(Professional Elective -III)

M.Tech (SE)-II Semester	**L**	**T**	**P**	**C**
	4	**0**	**0**	**4**

UNIT – I

Bearing capacity of Footings subjected to Eccentric and Inclined Loading – Meyrhoff's and Hanse's theories – elastic settlement of Footings embedded in sands and clays of Infinite thickness – Footings on soils of Finite thickness-Schmertamaunn's method, Jaubu and Morgenstern method.

UNIT - II

Pile Foundations – settlement of Pile groups resting in sands and clays – Negative skin friction – in single piles and groups of piles – under – reamed piles – specifications – load – carrying capacity in sands and clays.

UNIT – III

Caissons and well foundations : Types of caissons – well foundation Different shapes of wells – Components of wells – functions and Design – Design Criteria – Sinking of wells – lateral stability by Terzaghi's analysis.

UNIT – IV

Cantilever sheet piles and anchored bulkheads Earth pressure diagram – Determination of Depth of embedment in sands and clays – Timbering of trenches- Earth pressure diagrams – Forces in struts.

UNIT - V

Foundations in Expansive soils – Problems in Expansive soils – Mechanism of swelling – Swell Pressure and Swelling potential – Heave foundation practices – Sand cushion – CNS cushion – under – reamed pile Foundations – Granular pile – anchor technique, stabilization of expansive soils.

References

1. Analysis and Design of Substractenes – Swami Saran
2. Basic and Applied Soil Mechanics – Gopal Ranjan and A.S.R.Rao

3. Soil Mechanics & Foundation Engineering, Foundation Engineering – II - V.N.S. Murthy.

(B2420) GREEN BUILDINGS

(Professional Elective -III)

M.Tech (SE)-II Semester	**L**	**T**	**P**	**C**
	4	**0**	**0**	**4**

Unit-I

Overview of the significance of energy use and energy processes in building - Indoor activities and environmental control - Internal and external factors on energy use and the attributes of the factors - Characteristics of energy use and its management -
Macro aspect of energy use in dwellings and its implications.

Unit-II

Indoor environmental requirement and management - Thermal comfort - Ventilation and air quality - Air-conditioning requirement - Visual perception - Illumination requirement - Auditory requirement.

Unit-III

Climate, solar radiation and their influences - Sun-earth relationship and the energy balance on the earth's surface - Climate, wind, solar radiation, and temperature - Sun shading and solar radiation on surfaces - Energy impact on the shape and orientation of buildings.

Unit-IV

End-use, energy utilization and requirements - Lighting and day lighting - End -use energy requirements - Status of energy use in buildings Estimation of energy use in a building. Heat gain and thermal performance of building envelope - Steady and non steady heat transfer through the glazed window and the wall - Standards for thermal performance of building envelope -Evaluation of the overall thermal transfer.

Unit-V

Energy management options - Energy audit and energy targeting - Technological options for energy management.

Reference Books

1. J. Krieder and A. Rabl, Heating and Cooling of Buildings - Design for Efficiency, McGraw Hill, 1994.

2. S.M. Guinnes and Reynolds, Mechanical and Electrical Equipment for Buildings, Wiley, 1989.
3. Shaw, Energy Design for Architects, AEE Energy Books, 1991.
4. ASHRAE, Handbook of Fundamentals, Atlanta, 1997.
5. Donald W. Abrams, Low Energy Cooling – A Guide to the Practical Application of Passive Cooling and Cooling Energy Conservation Measures, Van Nostrand Reinhold Co., New York, 1986

(B2421) DESIGN OF SHELL & FOLDED PLATES STRUCTURES

(Professional Elective -IV)

M.Tech (SE)-II Semester	**L**	**T**	**P**	**C**
	4	**0**	**0**	**4**

UNIT I

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 II

Derivation of the governing DKJ equation for bending theory, - Schorer's theory - Application to the analysis and design of short and long shells. Beam theory of cylindrical shells: Beam and arch action, Analysis using beam theory.

UNIT III

Introduction to the shells of Double curvatures: Geometry, analysis and design of elliptic paraboloid, conoid and hyperbolic parabolic shapes, inverted umbrella type.

UNIT IV

Axi- Symmetrical shells: General equation - Analysis and axi-symmetrical by membrane theory. Application to spherical shell and hyperboloid of revolution cooling towers.

UNIT V

Folded plates – Introduction – Types of folded plates – structural behaviour of folded plates – advantages – Assumptions Whitney method of analysis – Edge shear equation - Analysis of folded plates of Whitney's method.

Simpsons method of Analysis of folded plates – moment and stress distribution – no notation and rotation solutions – continuous folded plates – pre stressed continuous folded plates.

Text Books

1. Analysis and design of concrete shell roofs By G.S.Ramaswami.
2. Design of concrete shell roof By Chaterjee

References

1 Design of concrete shell roofs By Billington
2 Shell Analysis By N.K.Bairagi.
2 Advanced R.C Design By Dr.N.Krishna Raju

(B2422) BRIDGE ENGINEERING

(Professional Elective -IV)

M.Tech (SE)-II Semester	**L**	**T**	**P**	**C**
	4	**0**	**0**	**4**

UNIT I

Concrete Bridges: Introduction-Types of Bridges-Economic span length-Types of loading-Dead load-live load-Impact Effect-Centrifugal force-wind loads-Lateral loads-Longitudinal forces-Sesmic loads- Frictioal resistance of expansion bearings-Secondary Stresses-Temperature Effect-Erection Forces and effects-Width of roadway and footway-General Design Requirements.

UNIT II

Solid slab Bridges: Introduction-Method of Analysis and Design.

UNIT III

Girder Bridges: Introduction-Method of Analysis and Design-Courbon's Theory, Grillage analogy

UNIT IV

Pre-Stressed Concrete Bridges: Basic principles-General Design requirements-Mild steel reinforcement in pre-stressed concrete member-Concrete cover and spacing of pre-stressing steel-Slender beams-Composite Section-Propped-Design of Propped Composite Section-Unproped composite section-Two-stage Prestressing-Shrinking stresses-General Design requirements for Road Bridges.

UNIT V

Analysis of Bridge Decks: Harmonic analysis and folded plate theory-Grillage analogy- Finite strip method and FEM. Sub-srtucture of bridges: Substructure- Beds block-Piers- Pier Dimensions- Design loads for piers-Abutments- Design loads for Abutments.

References

1. Design of Concrete Bridges by M.G.Aswani, V.N.Vazirani and M.M.Ratwani.
2. Bridge Deck Behaviour by E.C.Hambly
3. Concrete Bridge Design and Practice by V.K.Raina.

(B2422) EXPERIMENTAL STRESS ANALYSIS

(Professional Elective -IV)

M.Tech (SE)-II Semester	**L**	**T**	**P**	**C**
	4	**0**	**0**	**4**

UNIT I

Basic equations and Plane Elasticity Theory: Introduction, Strain equations of Transformation, Compatibility, Stress-Strain Relations-Two dimensional State of Stress. The Plane-Elastic problem, The Plane-Strain Approach, Plane Stress, Airy's Stress function-Cartesian Co-ordinates-Two dimensional problems in Polar Co-ordinates, Polar Components of Stress in terms of Airy's Stress function, Forms.

Principles of Experimental Approach: Merit of Experimental Analysis introduction, uses of experimental stress analysis-Advantages of experimental stress analysis, Different methods, Simplification of problems.

UNIT II

Strain Measurement using Strain Gauges: Definition of strain and its relation to Experimental Determinations, properties of strain-gauge systems, Types of strain gauges, Mechanical and Optical strain gauges. Electrical Strain Gauges- Introduction, LVDT - resistance strain gauge - various types - gauge factor, Materials for adhesion base, etc.

Strain Rosettes: Introduction, The three element rectangular Rosette - The delta rosette - Corrections for Transverse strain effects.

UNIT III

Brittle Coating Method: Introduction, Coating stresses - Failure theories - Brittle coating Crack pattern - Crack detection - Types of Brittle coating - Test procedures for brittle coating analysis - Calibration procedures - Analysis of brittle coating data.

UNIT IV

Theory of Photo Elasticity: Introduction, Temporary double refraction - The stress optic law - Effects of stressed model in a Polaris cope for various arrangements - Fringe sharpening, Brewster stress optic law.

UNIT V

Two Dimensional Photo Elasticity: Introduction, Isochromatic Fringe patterns - Isoclinic fringe patterns, passage of light through plane Polaris cope and circular Polaris cope, Isoclinic fringe pattern - Compensation techniques - calibration methods, separation methods, scaling Model to Proto type stress- Materials for photo - elasticity, properties of photo elastic materials.

References

1. Experimental Stress Analysis by J.W.Dally and W.F.Riley
2. Experimental Stress Analysis by Dr. Sadhu Singh
3. Experimental Stress Analysis by Dove and Adams

(B2424) OPTIMIZATION TECHNIQUES IN STRUCTURAL ENGINEERING

(Open Elective-II)

M.Tech (SE)-II Semester	**L**	**T**	**P**	**C**
	4	**0**	**0**	**4**

Unit-I: Introduction to Optimization:

Introduction - Historical developments - Engineering applications of Optimization - Statement of an Optimization problem - Classification of Optimization problems - Optimization Techniques. Optimization by calculus: Introduction - Unconstrained functions of a single variable - Problems involving simple constraints - Unconstrained functions of several variables - treatment of equality constraints - Extension to multiple equality constraints - Optimization with inequality constraints - The generalized Newton-Raphson method.

Unit-II: Linear Programming:

Introduction - Applications of linear programming - standard form of a linear programming problem - Geometry of linear programming problems - Definitions and theorems - Solution of a system of Linear simultaneous equations - Pivotal reduction of a general system of equations - Motivation of the Simplex Method - Simplex Algorithm - Two phases of the simplex method. non-Linear Programming: Introduction - Unimodal Function - Unrestricted search - Exhaustive search - Dichotomous search - Interval Halving method - Fibonacci method - Golden section method - Comparison of elimination methods - Unconstrained optimization techniques - Direct search methods - Random search methods - grid search method - Univariate method - Powell's method - Simplex method - Indirect search methods - Gradient of a function - Steepest descent method - Conjugate gradient - Newton's method.

Unit-III: Dynamic Programming:

Introduction - Multistage decision processes - concept of sub-optimization and the principle of optimality - computational procedure in dynamic programming - example illustrating the Calculus method of solution - example illustrating the Tabular of solution - conversion of a final value problem into an initial value problem - continuous dynamic programming - Additional applications.

Unit-IV: Network Analysis:
Introduction - Elementary graph theory - Network variables and problem types - Minimum-cost route - Network capacity problems - Modification of the directional sense of the network.

Unit-V:
Application of Optimization techniques to trusses, Beams and Frames.

References

1. Optimization: Theory and Applications by S.S.Rao.
2. Numerical Optimization Techniques for Engineering Design with applications by G.N.Vanderplaats
3. Elements of Structural Optimization by R.T.Haftka and Z.Gurdal.
4. Optimum Structural Design by U.Kirsch.
5. Optimum Design of Structures by K.I.Majid.
6. Introduction to Optimum Design by J.S.Arora.

(B2425) ADVANCED CONCRETE TECHNOLOGY

(Open Elective-II)

M.Tech (SE)-II Semester	L	T	P	C
	4	0	0	4

UNIT-I

Concrete Making Materials : Cement – Bogue's Compounds – Hydration Process – Types of Cement – Aggregates – Gradation Charts – Combined Aggregate – Alkali Silica Reaction – Admixtures – Chemical and Mineral Admixtures.

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 ratio, Maturity concept – Stress strain Behaviour – Creep and Shrinkage – Durability of Concrete – Non Destructive Testing of Concrete.

UNIT – III

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

High Performance Concrete – Requirements and Properties of High Performance Concrete – Design Considerations

UNIT – IV

Special Concretes: Self Compacting concrete, Polymer Concrete, Fibre Reinforced Concrete – Reactive Powder Concrete – Bacterial 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 requirements – form work systems – connections – specifications – design of form work – shores – removal of forms - shores – reshoring – failure of form work.

References

1. Special Structural concretes by Rafat Siddique, Galgotia Publications 2000.
2. Design of Concrete Mixes by N.Krishna Raju, CBS Publications, 2000.
3. Concrete: Micro Structure by P.K.Mehta, ICI, Chennai.
4. Properties of Concrete by A.M.Neville, ELBS publications Oct 1996.
5. Concrete Technology by A.R. Santhakumar, Oxford University Press
6. Concrete Technology by M.S.Shetty, S.Chand & Co 2009.
7. Concrete Technology by M.L. Gambhir, Tata McGraw-Hill Publishing Company Limited.
8. Building Construction by J.K.Mckay, Pearson Publications.

(B2426) COMPUTER AIDED DESIGN IN STRUCTURAL ENGINEERING

(Open Elective-II)

M.Tech (SE)-II Semester	**L**	**T**	**P**	**C**
	4	**0**	**0**	**4**

UNIT I

Introduction to computer aided design-An over view-computer as a design medium hardware components of a computer -programming languages.

C - Programming language-Introduction-An over view of programming in C-variables and data types-Declaration of variables-Initialization of variables-operators-arithmetic operators- precedence and associability-Input and output-Character I/O-Formatted output. Print f ()-Formatted input scan f ()-Examples.

UNIT II

C Programming Language-Control structures-If statement-Switch statement-loops-nested loops-while and for ,Do-While-continue statement-Go to statement-Examples.

C Programming Language-Arrays-One dimensional Arrays-Two Dimensional Arrays-pointer operators-pointer arithmetic-pointers and arrays-Matrix manipulations using arrays and pointers-pointers to functions-data files-basic operations-reading and writing and file accessing files-examples.

UNIT III

Computer Graphics-introduction -applications graphic devices-display devices-output and input devices-two dimensional geometric transformations-homogeneous co-ordinates-world co-ordinates-device co-ordinates-window to view port-transformations-clipping operations.

UNIT IV

Data base management system-introduction-data base systems-hardware-software-users-operational data independence-architecture of data base system-distributed databases.

UNIT V

Knowledge based expert system-introduction-artificial intelligence-components of an expert system-stages in expert system development-knowledge representation-inference mechanisms-applications.

References

1. Computer Aided Design by C.S.Krishnamoorthy and S.Rajeev
2. Computational Structures by S.Rajasekharan.

(B2427) CAD LAB

M.Tech (SE)-II Semester	L	T	P	C
	0	0	4	2

1 Program using arrays and functions for matrix manipulation.

2 Programs to draw bending moment and shear force diagrams. Using graphic in C

3. Program for design of slabs. Using Excel

4. Program for design of beams. Using Excel

5. Program for design of column and footing using excel

6. Analysis of truss using STAAD Pro.

7. Analysis of multistoried space frame, using STAAD Pro.

8. Analysis of Bridge deck slab.