CMR COLLEGE OF ENGINEERING & TECHNOLOGY

(An Autonomous Institution)

ACADEMIC REGULATIONS FOR M. TECH. (REGULAR) DEGREE COURSE

Applicable for the students of M. Tech. (Regular) Course from the Academic Year 2014-15 and onwards

The M. Tech. degree shall be conferred on candidates who are admitted to the program and who fulfil all the requirements for the award of the degree.

1.0 Eligibility for Admissions

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

Award of M. Tech. degree

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.

A student, who fails to fulfill all the academic requirements for the award of the degree within four academic years from the year of his admission, shall forfeit his seat in M. Tech. course.

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

The minimum instruction days in each semester are 90.

The medium of instruction and examination shall be English.

A. Courses of Study

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

1. Bio-Technology
2. Embedded Systems
3. Power Electronics
4. Structural Engineering
5. Computer Science & Engineering
6. Machine Design

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	Bio-Technology	Bio-Technology
2	ECE	Embedded Systems
3	EEE	Power Electronics
4	Civil	Structural Engineering
5	CSE	Computer Science & Engineering
6	Mechanical	Machine Design

Minimum Instructional Days and Attendance

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

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

A student shall be eligible to write semester end examinations if he acquires a minimum of 75% of attendance **in each of all the subjects**.

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

Shortage of attendance below 65% in aggregate shall not be condoned.

Students whose shortage of attendance is not condoned in any semester are not eligible to write their end semester examination of subjects of the corresponding semester and their registration shall stand cancelled.

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

A candidate shall put in a minimum required attendance, in at least 50% of the theory subjects in the present semester to get promoted to the next semester. In order to qualify for the award of the M. Tech. Degree, the candidate shall complete all the academic requirements of the subjects, as per the course structure.

A student will be promoted to the next semester if he satisfies the attendance requirement of the present semester including the days of attendance in sports, games, NCC and NSS activities subject to a maximum of 15 instructional days in a semester. Prior permission of the Head of the Department in writing shall be obtained by the students to avail the attendance from above mentioned activities.

5. Evaluation

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

For the theory subjects 60 marks shall be awarded based on the performance in the End Semester Examination and 40 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. Each internal examination shall be conducted for a total duration of 120 minutes. The final marks secured by each candidate in the internal evaluation is 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 makeup test/ examination shall be conducted.

5.1

Internal Examination

Part A (20 Marks)

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

Part B (20 Marks)

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

External Examination

Part A (20 Marks)

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

Part B (40 Marks)

5 questions (1 question from each unit with internal choice) each question carries 8 marks.

For practical subjects, 60 marks shall be awarded based on the performance in the End Semester Examinations. 40 marks shall be awarded in internal evaluation out of which 20 marks shall be for day to day evaluation and 20 marks shall be for internal examination.

There shall be seminar presentation each during of 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 be only internal evaluation of 50 marks. A candidate has to secure a minimum of 50% of marks to be declared successful.

There shall be a Comprehensive Viva-Voce in III Semester. The Comprehensive Viva-Voce will be conducted by a Committee consisting of Head of the Department and two Senior Faculty members of the Department. The Comprehensive Viva- Voce is intended to assess the students' understanding of various subjects he has studied during the M. Tech. course of study. 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.

A candidate shall be deemed to have secured the minimum academic requirement in a subject 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.

In case the candidate does not secure the minimum academic requirement in any subject (as specified in 5.5) he has to reappear for the End semester Examination in that subject. A candidate shall be given one chance to re-register for each subject provided the internal marks secured by a candidate are less than 50% and so has failed in the end examination. In such a case, the candidate must re-register for the subject(s) and secure the required minimum attendance. The candidate's attendance in the re-registered subject(s) shall be calculated separately to decide upon his eligibility for writing the end examination in those subject(s). In the event of the student taking another chance, his internal marks and end examination marks obtained in the previous attempt stand cancelled.

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

Laboratory examination for M. Tech. courses for 60 marks must be conducted with two Examiners, one of them being the Laboratory Class Teacher and the second examiner shall be appointed by the Controller of Examinations in consultation with the HOD.

6.0 Evaluation of Project / Dissertation Work:

The work on the project shall be initiated in the beginning of the III semester and the duration of the project is for two semesters. A Project Review Committee (PRC) shall be constituted comprising of Head of the Department and three other senior faculty members concerned with the M.Tech programme. The student can initiate the Project work only after obtaining the approval of PRC. This process is to be completed within four weeks of commencement of III semester.

6.1. The candidate shall be required to submit thesis or dissertation after taking up a topic approved by the Project Review Committee.

Registration of Project Work: A candidate is permitted to register for the project work after satisfying the attendance requirement of all the previous semesters and after obtaining the approval of the Institute Academic Committee.

After satisfying 6.2, 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 its approval.

If the candidate wishes to change his supervisor or topic of the project he can do so with approval of PRC. However, the PRC shall examine whether the change of topic/supervisor leads to a major change of his initial plans of project proposal. If so his date of registration for the project work starts from the date of change of supervisor or topic as the case may be.

Project work and Dissertation:

A candidate is permitted to submit project dissertation only after successful completion of all subjects (theory and practical), seminars, comprehensive viva-voce, and after 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 shall make an oral presentation before the PRC. Along with the draft thesis the candidate shall submit draft copy of a paper in standard format fit for publication in Journal / Conference, based on the project thesis, to the Head of the Department with due recommendation of the supervisor.

Four copies of the Project Dissertation certified by the Supervisor and Head of the Department shall be submitted to the College.

The dissertation shall be adjudicated by one examiner selected by the College. In case the thesis is found to be acceptable; viva-voce will be arranged. For this, Head of Department shall submit a panel of 3 examiners, who are eminent in that field, with the help of the PRC. The Controller of Examinations of the college in consultation with the College Academic Committee shall nominate the examiner.

If the report of the examiner is not favourable, the candidate shall revise and resubmit the dissertation, in the time frame as prescribed by PRC. If the report of the examiner is unfavourable again, the thesis shall be summarily rejected. The candidate can re-register only once for conduct of project and evaluation of dissertation, and will go through the entire process as mentioned above. The total duration for the M.Tech program is limited to four years.

If the report of the examiner is favourable, viva-voce examination shall be conducted by a Board consisting of the Head of the Department, Supervisor and the Examiner who adjudicated the Dissertation. The Board shall jointly report the student's performance in the project work as –

(a) Excellent, or

(b) Good, or

(c) Satisfactory, or

(d) Unsatisfactory,

as the case may be. In case, the student fails in the viva-voce examination, or gets the Unsatisfactory grade, he can re-appear only once for the viva-voce examination, as per the recommendations of the Board. If he fails at the second viva-voce examination, the candidate can re-register only once for conduct of project and evaluation of Dissertation, and will go through the entire process as mentioned above. The total duration for the M.Tech program is limited to four years.

7.0 Award of Degree and Class

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

of the following four classes:

Class Awarded	% of marks to be secured
First Class with Distinction	70% and above
First Class	Below 70% but not less than 60%
Second Class	Below 60% but not less than 50%

The marks in internal evaluation and end examination shall be shown separately in the memorandum of marks.

8. 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. His degree will be withheld in such cases.

9. Transitory Regulations

Discontinued, detained, or failed candidates are eligible for admission to two earlier or equivalent subjects at a time as and when offered.
The candidate who fails in any subject will be given two chances to pass the same subject; otherwise, he has to identify an equivalent subject as per the academic regulations.

10. General

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

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

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

.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 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.
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

		practicals 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 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 subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjectsof 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 or organizes a walk out or instigates others **to** examination hall walk out, or threatens the officer- in-charge or any person on duty in 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 subjects the candidate(s) has (have)

	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.	already appeared and shall not be permitted to appear for the remaining examinations of the subjects 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 subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all University examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat.
8.	Possess any lethal weapon or firearm in the examination hall.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of That semester/year. The candidate is also debarred and forfeits the seat.

9.	If student of the college, who is not a candidate for the particular examination or any person not connected with the college indulges in any malpractice or improper conduct mentioned in clause 6 to 8.	If the student belongs to the college, expulsion from the examination performance in that subject and all other subjects hall and cancellation of 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 other 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.
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 the 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 in correct 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 enquire.
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

COURSE STRUCTURE

AND

DETAILED SYLLABUS

For

M.Tech. (Structural Engineering)

(**Full Time Programme**)

Department

of

Civil Engineering

CMR College of Engineering & Technology

CMR COLLEGE OF ENGINEERING & TECHNOLOGY

(AUTONOMOUS)

With effective from 2014 onwards

Course Structure .M. Tech(Structural Engineering)

	SEMESTER-I				
Subject Code	**SUBJECT**	**L**	**T**	**P**	**C**
B1401	Computer Oriented Numerical Methods	3	1	0	3
B1402	Theory of Elasticity & Plasticity	3	1	0	3
B1403	Theory and Analysis of Plates	3	1	0	3
B1404	Advanced Reinforced Concrete Design	3	1	0	3
	Elective-I				
B1405	Concrete Technology	3	1	0	3
B1406	Seismic microzonation				
B1407	Optimization Techniques in Structural Engineering				
	Elective-II				
B1408	Advanced Structural Analysis	3	1	0	3
B1409	Soil Dynamics & Foundation Engineering				
B1410	Composite Materials				
B1411	Advanced Concrete Laboratory	0	0	3	2
B1412	Seminar-I	0	0	3	2
	Total Credits				22

	SEMESTER-II				
B1413	Finite Element Methods	3	1	0	3
B1414	Structural Dynamics	3	1	0	3
B1415	Analysis and Design of Shells & Folded Plates	3	1	0	3
B1416	Advanced Steel Design	3	1	0	3
	Elective-III				

B1417	Pre-Stressed Concrete.	3	1	0	3
B1418	Advanced Foundation Engineering				
B1419	Computer Aided Design in Structural Engineering (CAD)				
	Elective-IV				
B1420	Principles of Bridge Engineering	3	1	0	3
B1421	Earthquake Resistant Design of Buildings				
B1422	Plastic Analysis and Design.				
B1423	Stability of Structures				
B1424	CAD Laboratory	0	0	3	2
B1425	Seminar-II	0	0	3	2
	Total Credits				22

	SEMESTER-III				
B1426	Comprehensive Viva	0	0	3	2
B1427	Project Seminar	0	0	0	2
B1428	Project Work (continued to next semester-IV)	0	0	0	18
	Total Credits				22

	SEMESTER-IV				
B1428	Project Work and Seminar	0	0	0	22

CMR COLLEGE OF ENGINEERING &

TECHNOLOGY (AUTONOMOUS)

DETAILED SYLLABUS

M.Tech .SE-I Sem	**L**	**T**	**P**	**C**
	3	**1**	**0**	**3**

(B1401) COMPUTER ORIENTED NUMERICAL METHODS

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.

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M.Tech .SE-I Sem

L	T	P	C
3	1	0	3

(B1402) THEORY OF ELASTICITY AND PLASTICITY

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 corier 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 .

CMR COLLEGE OF ENGINEERING &

TECHNOLOGY (AUTONOMOUS)

M.Tech .SE-I Sem

L	T	P	C
3	1	0	3

(B1403) THEORY AND ANALYSIS OF PLATES

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
2. 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

CMR COLLEGE OF ENGINEERING &

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M.Tech .SE-I Sem

L	T	P	C
3	1	0	3

(B1404) ADVANCED REINFORCED CONCRETE DESIGN

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, 3rd 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, 3rd Edition, 2005. 550
4. Reinforced concrete structures, Vol.1, by B.C. Punmia, Ashok Kumar Jain and Arun Kumar Jain, Laxmi Publications, 2004
5. Reinforced concrete structures – I.C. Syal & A.K. Goel, S. Chand,

CMR COLLEGE OF ENGINEERING &

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M.Tech .SE-I Sem	**L**	**T**	**P**	**C**
	3	**1**	**0**	**3**

ELECTIVES I & II

(B1405) CONCRETE

TECHNOLOGY (ELECTIVE-I)

UNIT - I

Cement: chemical composition – Bogues compounds – heat of hydration – influence of compound composition on properties of cement – Admixtures – minal and chemical admixtures – disage – admixtures of RMC & HCC – latest generation admixture.

Admixtures: Classification of aggregate – particle shape and texture – gradation – fineness modules – grading curves. Gap graded aggregates – combined grading – alkali aggregate reaction – soundness of aggregate.

UNIT – II

Fresh Concrete: workability - factors affecting workability - measurement of workability - effect of time and temperature on work - segregation and bleeding, Mixing of setting times of concrete – steps in manufacture of concrete. Curing of concrete – Abram's law – Gel / space ratio – maturity concept – effective water in mix.

UNIT - III

Hardness Concrete : Strength in compression and tension – Testing of hardness concrete – modulus of elastics, shrinkage and creep of concrete – Rehology of creep – Non destructive and semi destructive testing of concrete – Durability of concrete.

UNIT – IV

Quality control of concrete – Quality assurance quality management and quality audit – statistical quality control – Acceptance criteria – codal provisions

Concrete mix design : Design of mixes by BIS method, ACI method, DOS method – Entroy and Shaklok method.

UNIT – V

Special Concrete: Light weight concrete mix design – Fiber reinforced concrete – SFRC and GFRC - Self Compacting concrete – polymen concrete – Geo Polymer concrete – high performance concrete – smart concrete.

TEXT BOOKS:

1. Properties of Concrete by A.M.Neville, ELBS publications
2. Concrete Technology by A.K. Santhakumar, Oxford Press.
3. Concrete Technology by M.S.Shetty, S.Chand & Co.

REFERENCES:

1. Special Structural concretes by Rajat Siddique, Galgotia Publications.
2. Design of Concrete Mixes by N.Krishna Raju, CBS Publications
3. Concrete: Micro Structure by P.K.Mehta, ICI, Chennai

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(B1406) SEISMIC MICROZONATION
(ELECTIVE-I)

UNIT I

Earthquake source: Earthquake source mechanisms. Review of moment tensors. Seismic inversion problem for a flat structure. Strong motion seismology. Reservoir Induced earthquakes.

UNIT II

Prediction of Strong ground motion: A theoretical study of the dependence of the Peak Ground Acceleration on source and structure parameters. High frequency earthquake strong ground motion in laterally varying media and the effect of fault zone. Physical mechanisms contributing to the seismic attenuation in the crust. Dynamic fracture mechanics. Near-field and far-field ground motions.

UNIT III

Strong motion data: Data acquisition and processing in strong motion seismology. Array analysis and synthesis mapping of strong seismic motion. Accelerogram spectral properties and prediction of peak values. Statistical model for peak ground motion from local to regional distances. Seismic intensity and its applications to engineering: a few case studies from Japan and Turkey.

UNIT IV

Complete strong motion synthetics: Numerical modeling of realistic fault rupture processes: Kinematic dislocation models, 3-D modeling of spontaneous fault rupture processes. Stochastic simulation of high frequency ground motions based on seismological models of radiated spectra. Use of random vibration theory to predict peak amplitudes of transient signals. Fault surface integral and techniques for earthquake ground motion calculation with applications to source parameterization to finite faults. Path effects in strong motion seismology. Hazard assessment: Probabilistic models for assessment of strong ground motion. Seismic source regionalization. Seismic risk and its estimation.

UNIT V

Site response and engineering application: Site response analysis using classical spectral ratio, generalized inverse technique, horizontal-to-vertical spectral ratio or receiver function, network average and Nakamura ratio. Determination of in-situ shear-wave velocity and Q-factor. Site amplification and its relation to surficial geologic condition. Constitutive relationships for soil dynamics. Soil structure interaction effects on strong ground motion. Engineering uses of strong motion data and seismic microzonation.

REFERENCES :

1. Fundamentals of earthquake engineering by Newmark N.M. and Rosenblueth E.
2. Geotechnical Earthquake Engineering By Kramer, S.L
3. Wai-Fah Chen & Scawthorn, Charles. " Earthquake Engineering Handbook", CRC Press London.

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(B1407) OPTIMIZATION TECHNIQUES IN STRUCTURAL ENGINEERING

(ELECTIVE-I)

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.

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.

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.

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.

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.

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(B1408) ADVANCED STRUCTURAL ANALYSIS

(ELECTIVE-II)

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.

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(B1409) SOIL DYNAMICS AND FOUNDATION ENGINEERING

(ELECTIVE-II)

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.

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(B1410) COMPOSITE MATERIALS (ELECTIVE-II)

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

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(B1411) ADVANCED CONCRETE LABORATORY

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.

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(B1412) SEMINAR-I

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(B1413) FINITE ELEMENT METHODS

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 3-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

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(B1414) STRUCTURAL DYNAMICS

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: 1893 - 1984, “Code of practice for Earthquake resistant design of Structures” and latest I.S: 1893 - 2002 (version) Part-1

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(B1415) ANALYSIS AND DESIGN OF SHELLS & FOLDED PLATES

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.
3 Advanced R.C Design By Dr.N.Krishna Raju

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(B1416) ADVANCED STEEL DESIGN

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

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ELECTIVES III & IV

(B1417) PRE-STRESSED CONCRETE

(ELECTIVE-III)

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.

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(B1418) ADVANCED FOUNDATION ENGINEERING (ELECTIVE-III)

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.

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(B1419)COMPUTER AIDED DESIGN IN STRUCTURAL ENGINEERING (ELECTIVE-III)

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.

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(B1420) PRINCIPLES OF BRIDGE ENGINEERING (ELECTIVE-IV)

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 raodway 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 prestessed 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.

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(B1421) EARTHQUAKE RESISTANT DESIGN OF BUILDINGS
(ELECTIVE-IV)

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 13920. 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: 1893 (Part-1) -2002. “Criteria for Earthquake Resistant – Design of structures.” B.I.S., NewDelhi.
2. IS:4326-1993, “ Earthquake Resistant Design and Construction of Building”, Code of Practice B.I.S., New Delhi.
3. IS:13920-1993, “ Ductile detailing of concrete structures subjected to seismic force” – Guidelines, B.I.S., New Delhi.

CMR COLLEGE OF ENGINEERING &

TECHNOLOGY (AUTONOMOUS)

M.Tech .SE-II Sem

L	T	P	C
3	1	0	3

(B1422) PLASTIC ANALYSIS AND DESIGN
(ELECTIVE-IV)

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

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TECHNOLOGY (AUTONOMOUS)

M.Tech .SE-II Sem

L	T	P	C
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(B1423) STABILITY OF STRUCTURES
(ELECTIVE-IV)

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

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TECHNOLOGY (AUTONOMOUS)

M.Tech .SE-II Sem	**L**	**T**	**P**	**C**
	0	**0**	**3**	**2**

(B1424) CAD LAB

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.

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M.Tech .SE-II Sem	**L**	**T**	**P**	**C**
	0	**0**	**3**	**2**

(B1425) SEMINAR-II

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M.Tech .SE-III Sem	**L**	**T**	**P**	**C**
	0	**0**	**3**	**2**

(B1426) COMPREHENSIVE VIVA

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M.Tech .SE-III Sem	**L**	**T**	**P**	**C**
	0	**0**	**0**	**2**

(B1428) PROJECT SEMINAR

CMR COLLEGE OF ENGINEERING &

TECHNOLOGY (AUTONOMOUS)

M.Tech .SE-III Sem	**L**	**T**	**P**	**C**
	0	**0**	**0**	**18**

(B1428)PROJECT WORK (CONTINUED TO NEXT SEMESTER IV)

CMR COLLEGE OF ENGINEERING &

TECHNOLOGY (AUTONOMOUS)

M.Tech .SE-IV Sem	**L**	**T**	**P**	**C**
	0	**0**	**0**	**22**

(B1428) PROJECT WORK AND SEMINAR