ACADEMIC REGULATIONS
COURSE STRUCTURE
AND
DETAILED SYLLABUS

Structural Engineering

For

M. Tech. Two Year Degree Course

(Applicable for the batches admitted from 2014-15)
(MR-14 Regulations)

Department of Civil Engineering

MALLA REDDY ENGINEERING COLLEGE

(AUTONOMOUS)

(An Autonomous institution, Autonomy granted by UGC and affiliated to JNTUH, Accredited by NAAC with 'A' Grade, Accredited by NBA (2008-11) & Recipient of World Bank Assistance under TEQIP phase – II S.C.1.1for the period (2011-14))

Maisammaguda, Dhulapally (Post. Via. Kompally), Secunderabad – 500 100.

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MALLA REDDY ENGINEERING COLLEGE (AUTONOMOUS)
Maisammaguda, Dhulapally (Post via. Kompally), Secunderabad – 500100

ACADEMIC REGULATIONS MR 14 FOR M. TECH. (REGULAR) DEGREE COURSE

(Effective for the students admitted into first year from the academic year 2014-2015)

The M.Tech Degree of Malla Reddy Engineering College, Hyderabad shall be conferred on candidates by the Jawaharlal Nehru Technological University Hyderabad (JNTUH), Hyderabad who are admitted to the program and fulfill all the requirements for the award of the Degree.

1.0 ELIGIBILITY FOR ADMISSIONS

Admission to the above program shall be made subject to the eligibility, qualifications and Specialization as prescribed by the university/college from time to time.

Admissions shall be made on the basis of merit/rank obtained by the qualifying candidate at an Entrance Test conducted by the University/college or on the basis of any other order of merit approved by the University/college (say **PGECET/GATE)** 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.

2.2 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.

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

2.4 The minimum instruction days in each semester are 90.

3.0 COURSES OF STUDY

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

1. Advanced Manufacturing Systems(AMS) - Shift II
2. Computer Science(CSe) - Shift I
3. Computer Science and Engineering(CSE) - Shift I & II
4. Control Systems(CS) - Shift I & II
5. Digital Systems and Computer Electronics(DSCE) - Shift I
6. Electrical Power Systems (EPS) - Shift I
7. Embedded Systems(ES) - Shift I
8. Geotechnical Engineering(GTE) - Shift I
9. Machine Designs (MD) - Shift I
10. Power Electronics and Electrical Drives(PEED) - Shift II
11. Structural Engineering(SE) - Shift I
12. Transportation Engineering(TE) - Shift II
13. Thermal Engineering(THE) - Shift I
14. VLSI System Design(VLSI SD) - Shift I

3.1 Departments offering M. Tech. Programmes with specializations are noted below:

Branch	Specialization	Specialization Code
Civil Engineering	1. Structural Engineering (SE) 2. Transportation Engineering (TE) 3. Geotechnical Engineering (GE)	11 12 13
Electrical and Electronics Engineering	1. Control Systems (CS) 2. Power Electronics and Electric Drives (PEED) 3. Electrical Power Systems (EPS)	22 23 24
Mechanical Engineering	1. Thermal Engineering (TE) 2. Advanced Manufacturing Systems (AMS) 3. Machine Designs (MD)	31 32 33
Electronics and Communication Engineering	1.Digital Systems and Computer Electronics (DSCE) 2. VLSI System Design (VLSI SD) 3. Embedded Systems (ES)	41 42 43
Computer Science and Engineering	1. Computer Science and Engineering (CSE) 2. Computer Science (CSe)	51 52

4.0 ATTENDANCE

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

4.1 A student shall be eligible to write University examinations if he acquires a minimum of 75% of attendance in aggregate of all the subjects.

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

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

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

4.5 A prescribed fee shall be payable towards condonation of shortage of attendance.

4.6 A student shall not be promoted to the next semester unless he satisfies the attendance requirement of the present semester, as applicable. They may seek readmission into that semester when offered next. If any candidate fulfills the attendance requirement in the present semester, he shall not be eligible for readmission into the same class.

4.7 A student shall not be promoted to the next semester unless he satisfies the attendance requirements of the previous semester including the days of attendance in sports, games, NCC and NSS activities.

5.0 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.

5.1 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. The internal evaluation shall be made based on the **average** of the marks secured in the two Mid Term-Examinations conducted-one in the middle of the Semester and the other immediately after the completion of instruction. Each mid term examination shall be conducted for a total duration of 120 minutes with Part A as 2 questions to be answered out of 4 questions each question for 10 marks and Part B with 4 questions to be answered out of 6 questions each question for 5 marks. If any candidate is absent for any subject of a mid -term examination, an additional exam will be conducted in the deserving cases based on the recommendations of the College Academic Committee. End semester examination is conducted for 60 marks with 5 questions to be answered out of 8 questions, each question carries 12 marks.

5.2 For practical subjects, 60 marks shall be awarded based on the performance in the End Semester Examinations and 40 marks shall be awarded based on the day-to-day performance as Internal Marks.

5.3 There shall be two seminar presentations during I year I semester and 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.

5.4 There shall be a Comprehensive Viva-Voce in II year I 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.

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

5.6 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.

5.7 Laboratory examination for M. Tech. courses must be conducted with two Examiners, one of them being the Laboratory Class Teacher and the second examiner shall be another Laboratory Teacher.

6.0 EVALUATION OF PROJECT/DISSERTATION WORK

Every candidate shall be required to submit a thesis or dissertation after taking up a topic approved by the Project Review Committee(PRC).

6.1 A Project Review Committee shall be constituted with Principal as chair person, Head of the Department, Coordinator, Supervisor and two other senior faculty members.

6.2 Registration of Project Work: A candidate is permitted to register for the project work after satisfying the attendance requirement of all the subjects (theory and practical subjects).

6.3 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 Departmental Academic Committee for its approval. Only after obtaining the approval of the Departmental Academic Committee can the student initiate the Project work. Departmental Academic Committee(DAC) Consists of Head of the Department as Chairman, along with two Senior Professors and few subject experts too.

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

6.5 Candidate shall submit status report (in a bound-form) in two stages at least with a gap of 3 months between them.

6.6 The work on the project shall be initiated in the beginning of the second year and the duration of the project is for two semesters. A candidate is permitted to submit Project Thesis only after successful completion of theory and practical course 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 Principal (through Head of the Department) and shall make an oral presentation/demonstration before the PRC.

6.7 Three copies of the Project Thesis certified by the supervisor shall be submitted to the College/ Institute.

6.8 The thesis shall be adjudicated by one examiner selected by the College. For this, Head of the Department shall submit a panel of 3 examiners to the Chief Controller of Examinations of the College, who are eminent in that field with the help of the concerned guide and Head of the department.

6.9 If the report of the examiner is not favorable, the candidate shall revise and resubmit the Thesis, in the time frame as described by PRC. If the report of the examiner is unfavorable again, the thesis shall be summarily rejected.

6.10 If the report of the examiner is favourable, Viva-Voce examination shall be conducted by a board consisting of the Supervisor, Head of the Department and the examiner who adjudicated the Thesis. The Board shall jointly report the candidate's work as one of the following:

A. Excellent
B. Good
C. Satisfactory
D. Not Satisfactory

The Head of the Department shall coordinate and make arrangements for the conduct of Viva- Voce examination.

If the report of the viva-voce is unsatisfactory, the candidate will retake the viva-voce examination after three months. If he fails to get a satisfactory report at the second Viva-Voce examination, he will not be eligible for the award of the degree unless he is asked to revise and resubmit by the Board.

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%
Pass Class	Below 50% but not less than 40%

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

8.0 WITH-HOLDING OF RESULTS

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

9.0 TRANSITORY REGULATIONS

9.1 Discontinued, detained or failed candidates are eligible for admission to two earlier or equivalent subjects at a time as and when offered.
9.2 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 MR14 academic regulations.

10.0 GENERAL

10.1 The academic regulations should be read as a whole for purpose of any interpretation.
10.2 In case of any doubt or ambiguity in the interpretation of the above rules, the decision of the Principal is final.
10.3 The College may change or amend the academic regulations and syllabus at any time and the changes and amendments made shall be applicable to all the students with effect from the date notified by the College.
10.4 Wherever the word he, him or his occur, it will also include she, her and hers.
10.5 Wherever the word 'Subject' occurs in the above regulations, it implies the 'Theory Subject' and 'Practical Subject' or 'Lab'.
10.6 Transfers not allowed among group colleges.

MALPRACTICES RULES

DISCIPLINARY ACTION FOR / IMPROPER CONDUCT IN EXAMINATIONS

	Nature of Malpractices/Improper conduct	**Punishment**
	If the candidate:	
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 mark son the body of the candidate which can be used as an aid in the subject of the examination)	Expulsion from the examination hall and cancellation of the performance in that subject only.
(b)	Gives assistance or guidance or receives it from any other candidate orally or by any other body language methods or communicates through cell phones with any candidate or persons in or outside the exam hall in respect of any matter.	Expulsion from the examination hall and cancellation of the performance in that subject only of all the candidates involved. In case of an outsider, he will be handed over to the police and a case is registered against him.
2	Has copied in the examination hall from any paper, book, programmable calculators, palm computers or any other form of material relevant to the subject of the examination (theory or practical) in which the candidate is appearing.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted to appear for the remaining examinations of the subjects of that Semester/year. The Hall Ticket of the candidate is to be cancelled and sent to the University.
3	Impersonates any other candidate in connection with the examination.	The candidate who has impersonated shall be expelled from examination hall. The candidate is also debarred 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 shallot 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 University examinations. The continuation of the course by the candidate is subject tithe academic regulations in connection with forfeiture of seat. If the imposter is an outsider, he will be handed over to the police and a case is registered against him.
4	Smuggles in the Answer book or additional sheet or takes out or arranges to send out the question paper during the examination or answer book or additional sheet, during or after the examination.	Expulsion from the examination hall and cancellation of performance in that subject and all the other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all University examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat.
5	Uses objectionable, abusive or offensive language in the answer paper or in letters to the examiners or writes to the examiner requesting him to award pass marks.	Cancellation of the performance in that subject

6	Refuses to obey the orders of the Chief Superintendent/Assistant –Superintendent / any officer on duty or misbehaves or creates disturbance of any kind in and around the examination hall or organizes a walk out or instigates others to walk out, or threatens the officer-in charge or any person on duty in or outside the examination hall of any injury to the person or to any of his relations whether by words, either spoken or written or by signs or by visible representation, assaults the officer-incharge,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.	In case of students of the college, they shall be expelled from examination halls and cancellation of their performance in that subject and all other subjects the candidate(s) has (have) already appeared and shall not be permitted to appear for the remaining examinations of the subjects of that semester/year. The candidates also are debarred and forfeit their seats. In case of outsiders, they will be handed over to the police and a police cases 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.	Student of the colleges expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred and forfeits the seat. Person(s) who do not belong to the College will be handed over to police and, a police case will be registered against them.
10	Comes in a drunken condition to the examination hall.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year.
11	Copying detected on the basis of internal evidence, such as, during valuation or during special scrutiny.	Cancellation of the performance in that subject and all other subjects the candidate has appeared including practical examinations and project work of that semester/year examinations.

12	If any malpractice is detected which is not covered in the above clauses 1 to 11 shall be reported to the University for further action toward suitable punishment.	

Malpractices identified by squad or special invigilators

1. Punishments to the candidates as per the above guidelines.

2. Punishment for institutions: (if the squad reports that the college is also involved in encouraging malpractices)
   (i) A show cause notice shall be issued to the college.
   (ii) Impose a suitable fine on the college.
   (iii) Shifting the examination centre from the college to another college for a specificperiod of not less than one year.

MALLA REDDY ENGINEERING COLLEGE
(Autonomous)
M.Tech Structural Engineering

COURSE STRUCTURE

I YEAR I SEMESTER

CODE NO	GROUP	SUBJECT	L	T	p	C
40M09	Core	Computer Oriented Numerical Methods	3	1	0	3
41101		Theory Of Elasticity and Plasticity	3	1	0	3
41102		Theory And Analysis of Plates	3	1	0	3
41103		Advanced Reinforced Concrete Design	3	1	0	3
411A1	Elective-I	Advanced Concrete Technology	3	1	0	3
40M10		Optimization Techniques in Structural Engineering				
411A2		Experimental Stress Analysis				
411B1	Elective-II	Advanced Structural Analysis	3	1	0	3
411B2		Computer Aided Design in Structural Engineering(CAD)				
411B3		Composite Materials				
41104		Advanced Concrete Lab	0	0	3	2
41105		Seminar-I	0	3	0	2
		credits	18	9	3	22

I YEAR II SEMESTER

CODE NO	GROUP	TITLE OF THE COURSE	L	T	p	C
41106	Core	Finite Element Methods	3	1	0	3
41107		Structural Dynamics	3	1	0	3
41108		Soil Dynamics and Foundation Engineering	3	1	0	3
41109		Advanced Steel Design	3	1	0	3
411C1	Elective-III	Prestressed Concrete	3	1	0	3
411C2		Advanced Foundation Engineering				
411C3		Principles of Bridge Engineering				
411D1	Elective-IV	Analysis and Design of Shells and folded Plates	3	1	0	3
411D2		Earthquake Resistant Design of Buildings				
411D3		Plastic Analysis and Design				
41110		CAD Lab	0	0	3	2
41111		Seminar-II	0	3	0	2
		Total	18	9	3	22

II YEAR I SEMESTER & II SEMESTER

CODE	TITLE OF THE COURSE	L	T	P	C
41112	Comprehensive Viva	-	3	-	4
41113	Project & Seminar	-	-	-	40
	Total				44

MALLA REDDY ENGINEERING COLLEGE
(Autonomous)

M.TECH. (STRUCTURAL ENGINEERING)	**L**	**T/P/D**	**C**
I YEAR I SEM	**3**	**1/-/-**	**3**

COMPUTER ORIENTED NUMERICAL METHODS

Learning Objectives:

Student will be able to

1. Apply the basic knowledge of mathematics in engineering.
2. Provide a formidable base for analysis and programming using computer applications.
3. Develop the ability in programming and solutions based on the various analysis tools.

UNIT I

SOLUTIONS OF LINEAR EQUATIONS: DIRECT METHOD – Cramers 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- Givens method for symmetric matrices- Householders 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 – Midpoint method – single step method, Taylor's series method- Boundary value problems.

Learning Outcomes:

On successful completion of this course, it is expected that students should be able to

1. Apply it to basic (linear) ordinary and partial differential equations.
2. Identify mathematical model for solution of common engineering problems.
3. Formulate simple problems into programming models.

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.
3. Applied numerical analysis by – Curtis I.Gerala- Addission Wasley – published campus.
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.

2014-2015 **Code: 41101**

MALLA REDDY ENGINEERING COLLEGE
(Autonomous)

M.TECH.(STRUCTURAL ENGINEERING) **L T/P/D C**
I YEAR I SEM **3 1/-/- 3**

THEORY OF ELASTICITY AND PLASTICITY

Learning Objectives:
Student will be able to
1. Define stresses, strains, equilibrium and compatibility.
2. Derive the governing equilibrium equations.
3. Define stresses, strains, equilibrium and compatibility in three-dimensional problems.
4. Solve the problems in plane stress, plane strain, torsion, bending.
5. Build a connection between advanced undergraduate and graduate courses in elasticity and the mechanics of materials, Hence to emphasize theory and application which prepare a student for more advanced study or for professional practice in design and analysis.

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 Plastic stress strain relationship. Elastic plastic problems in bending-torsion and thick cylinder.

Learning Outcomes: On successful completion of this course, it is expected that students should be able to

1. Identify and analyse the stress problems in an elastic body.
2. Identify and analyse the deformation problems in an elastic body.
3. Acquire the concepts on theory of elasticity and theory of plasticity.
4. Solve selected problems of theory of elasticity.

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.
5. Theory of elasticity by sadhu singh,Khanna publishers

MALLA REDDY ENGINEERING COLLEGE
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M.TECH.(STRUCTURAL ENGINEERING)	**L**	**T/P/D**	**C**
I YEAR I SEM	**3**	**1/-/-**	**3**

THEORY AND ANALYSIS OF PLATES

Learning Objectives:
Student will be able to
1.Achieve fundamental understanding of the classical theory of elastic plates.
2.Introduce analytical and numerical solution techniques in thin plate theory.
3.Apply theory of plates to the problems involving various geometrics and boundary conditions.
4.Apply Navier, Levy's, and Rayleigh—Ritz solutions to plates with different end conditions.
5.Provide enhanced knowledge in solid mechanics and advanced structural

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 – Levys 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.

Learning Outcomes:
On successful completion of this course, it is expected that students should be able to

1. Apply the theory of plates in engineering designs.
2. Discover and exploit various modelling avenues for structural engineering components and obtain the exact and/or approximate solutions.
3. Select an appropriate plate theory for different Engineering applications.
4. Gain a thorough understanding of Kirchhoff's, First order shear deformation theories.

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.

2014-2015 **Code: 41103**

MALLA REDDY ENGINEERING COLLEGE
(Autonomous)

M.TECH.(STRUCTURAL ENGINEERING)	**L**	**T/P/D**	**C**
I YEAR I SEM	**3**	**1/-/-**	**3**

ADVANCED REINFORCED CONCRETE DESIGN

Learning Objectives:

Student will be able to

1. Compare, contrast and apply alternative methods of design for reinforced concrete beams & slabs.
2. Understand and apply the design guidance used in current codes of practice for the design of Shear Walls & Corbels.
3. Understand the different sources of cracking in concrete structures.
4. Understand the mechanisms causing flexural and shrinkage cracking, the design guidance in current codes of practice and the use and limitations of such methods in design.

UNIT I

BASIC DESIGN CONCEPTS: Behavior in Flexure, Design of Singly Reinforced Rectangular Sections, Design of Doubly Reinforced Rectangular Sections, Design of Flanged Beams Sections, Design For Shear, Design For Torsion, Limit State of Serviceability: Deflections of Reinforced Concrete Beams And Slabs Short Term Deflections And Long Term Deflections, Estimation of Crack Width in RCC Members , Calculation of Crack Widths

UNIT II

LIMIT ANALYSIS OF R.C.STRUCTURES: Rotation of a plastic hinge, Redistribution of moments, moment rotation characteristics of RC member, I.S. code provisions, applications for fixed and continuous beam. Yield line analysis for slabs: Upper bound and lower bound theorems – yield line criterion – Virtual work and equilibrium methods of analysis – For square and circular slabs with simple and continuous end conditions.

UNIT III

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 IV

DESIGN OF REINFORCED CONCRETE DEEP BEAMS & CORBELS: Steps of Designing Deep Beams, Design by IS 456, Checking for Local Failures, Detailing of Deep Beams, Analysis of Forces in a Corbels , Design of Procedure of Corbels , Design of Nibs.

UNIT V

DESIGN OF COMPRESSION MEMBERS- Estimation of Effective Length of A Column –Code Requirements on Slenderness Limits – Design of Short Columns Under Axial Compression- Design of Short Columns Under Compression With Uni-Axial Bending- Design of Short Columns Under Axial Compression With Biaxial Bending- Design of Slender Columns

DESIGN OF COMBINED FOOTINGS- Distribution of Soil Pressure- Geometry of Two Column Combined Footing- Design Consideration in Two Column Footings.

Learning Outcomes:

On successful completion of this course, it is expected that students should be able to

1. Calculate short-term and long-term deflections for RC elements.
2. Analyse the flexural and shear capacity of existing RC elements.
3. Calculate the ductility of a reinforced concrete section.
4. Design for shear of RC elements. Science & Mathematics (Knowledge and understanding of mathematical models as applied to reinforced concrete design).
5. Design (broader knowledge and understanding of design processes for reinforced concrete structural elements and systems).
6. Engineering Practice (a thorough understanding of how the physical and mechanical properties of concrete influence design methods and construction processes).

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.
4. "Reinforced concrete design" by S.Unnikrishna Ipllai & Devdas Menon; Tata Mc.Graw-Hill Publishing Company Ltd.New Delhi2010.
5. "Advance Reinforced Concrete" P.C.Varghese prentice Hall of INDIA Private Ltd.2008

MALLA REDDY ENGINEERING COLLEGE
(Autonomous)

M.TECH.(STRUCTURAL ENGINEERING) **L T/P/D C**
I YEAR I SEM **3 1/-/- 3**

ADVANCED CONCRETE TECHNOLOGY
(ELECTIVE 1)

Learning Objectives:
Student will be able to
1.Use different types of cement as per their properties for different field applications.
2. Design economic concrete mix proportion for different exposure conditions and intended purposes.
3. Supervise various concreting operations.
4. Carry out field and laboratory tests on concrete in plastic and hardened stage.

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 – Abrams 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 – polymer concrete – Geo Polymer concrete – high performance concrete – smart concrete.

Learning Outcomes:
On successful completion of this course, it is expected that students should be able to
1. Determine the properties of concrete ingredients i.e. Cement, sand, coarse aggregate by conducting different tests.
2. Recognize the effects of the rheology and early age properties of concrete on its long-term behavior.
3. Develop an advanced knowledge of the mechanical performance of cement based materials and how it can be controlled
4. Use various chemical admixtures and mineral additives to design cement based materials with tailor-made properties
5. Use advanced laboratory techniques to characterize cement-based materials.
6. Understand the mix design and engineering properties of special concretes such as high-performance concrete, self-consolidating concrete, fibre reinforced concrete, sprayed concrete, etc.

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.
4 Rudnani.G,Light weight concrete Academic Kiado,Publishing home of Hungarian. Academy of sciences, 1963.

MALLA REDDY ENGINEERING COLLEGE
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M.TECH.(STRUCTURAL ENGINEERING)	**L**	**T/P/D**	**C**
I YEAR I SEM	**3**	**1/-/-**	**3**

OPTIMIZATION TECHNIQUES IN STRUCTURAL ENGINEERING
(ELECTIVE 1)

Learning Objectives:

Student will be able to

1. Define statement of optimization problem
2. Solve optimization problems using linear programming
3. Solve optimization problems using Dynamic programming
4. Optimize structural elements like beams, trusses and frames and achieve efficient designs based on various applications and objective functions for professional practice.

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.

Learning Outcomes:

1. On successful completion of this course, it is expected that students should be able to
2. Understand Engineering optimization.
3. Classify the optimization problems.
4. Understand various methods of linear programming & Dynamic programming.
5. Apply optimization techniques to trusses, beams & 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.
7. Iyengar.N.G.R and Guptha S.K,"Structural design of optimization "Affiliated to east west press Ltd, Newdelhi,1997.

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M.TECH.(STRUCTURAL ENGINEERING)	**L**	**T/P/D**	**C**
I YEAR I SEM	**3**	**1/-/-**	**3**

EXPERIMENTAL STRESS ANALYSIS
(ELECTIVE 1)

Learning Objectives:
Student will be able to

1. The objective of the course is to provide the *tools of research* necessary to design equipment and/or instrumentation schemes for directed studies. It is intended for structural and geotechnical graduates conducting research toward the completion of a master's thesis or doctoral dissertation.

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, Airys Stress function-Cartesian Co-ordinates-Two dimensional problems in Polar Co-ordinates, Polar Components of Stress in terms of Airys 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 elements 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.

Learning Outcomes:
On successful completion of this course, it is expected that students should be abl

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

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M.TECH.(STRUCTURAL ENGINEERING)	**L**	**T/P/D**	**C**
I YEAR I SEM	**3**	**1/-/-**	**3**

ADVANCED STRUCTURAL ANALYSIS
(ELECTIVE II)

Learning Objectives:
Student will be able to

1. Learn how to compute static and kinematic indeterminacies of various types of structures.
2. Know how to generate the stiffness matrix for continuous beams, portal frames and trusses.
3. Know how to generate the flexibility matrix for continuous beams, portal frames and trusses.
4. Understand the structural behavior of frames with and without shear walls.

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 behavior of large frames with and without shear walls - approximate methods of analysis of shear walls.

Learning Outcomes:
On successful completion of this course, it is expected that students should be able to

1. Generate the global stiffness matrix by assembling the element stiffness matrices.
2. Analyze the continuous beams, portal frames and trusses by matrix stiffness method.
3. Analyze the continuous beams, portal frames and trusses by matrix flexibilitymethod.
4. Understand the necessity of shear walls and its analysis by various methods.

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

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MALLA REDDY ENGINEERING COLLEGE
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M.TECH.(STRUCTURAL ENGINEERING)	**L**	**T/P/D**	**C**
I YEAR I SEM	**3**	**1/-/-**	**3**

COMPUTER AIDED DESIGN IN STRUCTURAL ENGINEERING
(ELECTIVE II)

Learning Objectives:
Student will be able to

1. Understand computer as a design medium.
2. Write different programs using "C" language.
3. Write various program using "C" graphics.
4. Understand database management systems.
5. Know about artificial intelligence.

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. Principal of neural networks-Architectures application of KBES-Expert system shells.

UNIT V

KNOWLEDGE BASED EXPERT SYSTEM-INTRODUCTION-artificial intelligence-components of an expert system-stages in expert system development-knowledge representation-inference mechanisms-applications.

Learning Outcomes:
On successful completion of this course, it is expected that students should be able to

1. Write programs using C language
2. Write programs using C graphics and generate display of geometries
3. Analyse problems of structural analysis using C and C graphics
4. Work with the operations of DBMS
5. Represent development of Knowledge based expert system

REFERENCES

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

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M.TECH.(STRUCTURAL ENGINEERING)	**L**	**T/P/D**	**C**
I YEAR I SEM	**3**	**1/-/-**	**3**

COMPOSITE MATERIALS
(ELECTIVE II)

Learning Objectives:
Student will be able to

1. Develop an understanding of the linear elastic analysis of composite materials.
2. Understanding the concepts such as anisotropic material behavior and the analysis of laminated plates.
3. Understand the underlying principles and techniques associated with the stress analysis and strength predictions of composite material structures.

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.

Learning Outcomes:
On successful completion of this course, it is expected that students should be able to

1. Analyze problems on macromechanical behavior of lamina.
2. Analyze problems on micromechanical behavior of lamina.
3. Analyze problems on macromechanical behavior of laminate.
4. Analyze problems on bending, buckling, and vibration of laminated plates and beams.

Reference:

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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M.TECH.(STRUCTURAL ENGINEERING)	**L**	**T/P/D**	**C**
I YEAR ISEM	**0**	**0/3/0**	**2**

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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MALLA REDDY ENGINEERING COLLEGE
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M.TECH.(STRUCTURAL ENGINEERING) **L T/P/D C**
I YEAR II SEM **3 1/-/- 3**

FINITE ELEMENT METHODS

Learning Objectives:

Student will be able to

1. Develop the skills in applying the basic matrix operation to form a global matrix equation and enforce the concept of steps in obtaining solutions for 1-D structures.
2. Develop the skills in applying the interpolation functions to solve bar, beam problems.
3. Gain some knowledge and analysis skills in forming basic data required in a FEM computer program.
4. Develop the skills in applying the Gaussian quadrature in computing integration in FEM.

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 isoperimetric elements for 2D analysis -formulation of 4-noded and 8-noded isoperimetric 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 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.

Learning Outcomes:

On successful completion of this course, it is expected that students should be able to

1. Learn how to apply it to basic (linear) ordinary and partial differential equations.
2. Learn how to implement the finite element method efficiently in order to solve field problems.
3. Identify mathematical model for solution of common engineering problems.
4. Formulate simple problems into finite elements.
5. Solve structural, fluid flow, impact and crash problems.
6. Solve complicated 3D structural problems for stress analysis under different loads.

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 programming 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.
6. S.S.Bhavikatti,"Finite element analysis, "New age publisher.

2014-2015 **Code: 41107**

MALLA REDDY ENGINEERING COLLEGE
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M.TECH.(STRUCTURAL ENGINEERING)	**L**	**T/P/D**	**C**
I YEAR II SEM	**3**	**1/-/-**	**3**

STRUCTURAL DYNAMICS

Learning Objectives:

Student will be able to

1. Know the fundamental concepts and theory of dynamic analysis.
2. Understand the free vibrations concepts and the problem of determining the natural
3. frequency of a system.
4. Understand the free vibrations concepts of harmonically excited vibrations.
5. Understand the free Vibrations of Multi -degree of freedom.

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.

Learning Outcomes:

On successful completion of this course, it is expected that students should be able to

1. Apply the fundamental concepts and definitions used in structural dynamics.
2. Calculate the natural frequency of a system using equilibrium or energy methods.
3. Determine the effect of viscous damping on the response of a freely vibrating system.
4. Determine the response of a system to a harmonic excitation.
5. Understand of the fundamental concepts of earthquake engineering.

References:

1. Dynamics of Structures by Clough & Penzien, McGraw Hill, New york
2. Structural Dynamics by Mario Paz, C.B.S Publishers, New Delhi.
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

2014-2015 **Code: 41108**

MALLA REDDY ENGINEERING COLLEGE
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M.TECH.(STRUCTURAL ENGINEERING)	**L**	**T/P/D**	**C**
I YEAR II SEM	**3**	**1/-/-**	**3**

SOIL DYNAMICS AND FOUNDATION ENGINEERING

Learning Objectives:
Student will be able to
1. Use the techniques, skills, and modern engineering tools necessary for engineering practice.
2. Understand the impact of engineering solutions in economic and environmental context.
3. Design, analyze and interpret data related to the geotechnical engineering.

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.

Learning Outcomes:
On successful completion of this course, it is expected that students should be able to
1. Accentuate the understanding of the basic principles and exposes the student to the latest developments, with a strong research orientation.
2. Identify, formulate and solve foundation related problems.
   Understand the latest trends, modern standards and state-of-the-art techniques for geotechnical engineering.

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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M.TECH.(STRUCTURAL ENGINEERING)	**L**	**T/P/D**	**C**
I YEAR II SEM	**3**	**1/-/-**	**3**

ADVANCED STEEL DESIGN

Learning Objectives:
Student will be able to
1. Learn how to compute the Dead, Live and Wind loads on roofs.
2. Know the analysis of multistory building frames by various approximate methods such as
3. Portal, Cantilever and Factor method.
4. Learn how to design compression and tension members of a steel truss girder bridges.
5. Understand the Static and Kinematic methods of Plastic analysis.

UNIT I

SIMPLE CONNECTIONS – RIVETED, BOLTED PINNED AND WELDED CONNECTIONS:
Riveted Connections- Bolted Connections- Load Transfer Mechanism- Failure of Bolted joints – specifications for bolted joints –Bearing – Types Connections – Tensile strength of Plate – Strength and Efficiency of the Joint – Combined shear and Tension for slip – Critical connections –Prying Action-Combined Shear and Tension for Slip-Critical Connections. Design of Groove welds – Design of Fillet Welds- Design of Intermittent Fillet Welds – Failure of Welds.

UNIT II

ECCENTRIC AND MOMENT CONNECTIONS:
Introduction – Beams, columns- connections-connections subjected to eccentric shear –bolted framed connection – bolted seat connections – bolted bracket connection ,bolted moment connections-welded framed connections-welded bracket connections- moment resistant connections

UNIT III

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

UNIT IV

DESIGN OF STEEL TRUSS GIRDER BRIDGES:
Types of truss bridges, component parts of a truss bridge, economic Proportions of trusses, self weight of truss girders, design of bridge Compression members, tension members; wind load on truss girder Bridges; wind effect on top lateral bracing; bottom lateral bracing; portal Bracing; sway bracing.

UNIT-V

DESIGN OF STEEL BUNKERS AND SILOS
Introduction – janssen's theory – Airy's theory –Design of parameters – Design Cireteria- Analysis of bins-Hopper Bottom-Design of bins

Learning Outcomes:
On successful completion of this course, it is expected that students should be able to
1. Analyse and design the industrial buildings
2. Compute the axial forces, shear forces and bending moments in beams and colum of a multistory building frame and can sketch SFD, BMD.
3. Calculate the forces in various members of steel truss girder bridge and design the components of the bridge.
4. Compute the collapse loads, plastic moment capacities of continuous beams, portal frames and gable frames.

References:

1. Design of Steel Structures. P.Dayaratnam
2. Design Steel Structures by Gaylord and Gaylord.
3. Design of steel structures. Vol.II by Dr. Ramachandra
4. Structural Design & Drawing by N. Krishna Raju
5. Plastic Design by Beedal.
6. Design of steel Structures by B.C. Punmia
7. Limit state design of stell structures –s.k.duggal
8. Indian standard code –IS-800:2007

2014-2015 **Code: 411C1**

MALLA REDDY ENGINEERING COLLEGE
(Autonomous)

M.TECH.(STRUCTURAL ENGINEERING)	**L**	**T/P/D**	**C**
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PRE-STRESSED CONCRETE
(ELECTIVE III)

Learning Objectives:
Student will be able to
1. Develop an understanding of the necessity of prestressed concrete structures.
2. Develop an understanding of various techniques of prestressing.
3. Develop an understanding of the design of prestressed concrete members for ultimate limit state and limit state of serviceability.
4. Develop an understanding of the design of continuous beams and simple portal frames.

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)

Learning Outcomes:
On successful completion of this course, it is expected that students should be able to
1. Acquire the knowledge of evolution of process of prestressing.
2. Acquire the knowledge of various prestressing techniques.
3. Develop skills in analysis and design of prestressed concrete beams, and slabs.
4. Develop skills to satisfy the serviceability and strength provisions of the Indian
5. Standards (IS: 1343-1980).

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.
4.Rajagopalam.N,Prestressed concrete,Narosa publications New delhi.
5.Sinha.N.C&Roy.S.K,"Fundementals of prestressed concrete.",S.Chand&co.

2014-2015 **Code: 411C2**

MALLA REDDY ENGINEERING COLLEGE
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M.TECH.(STRUCTURAL ENGINEERING)	**L**	**T/P/D**	**C**
I YEAR II SEM	**3**	**1/-/-**	**3**

ADVANCED FOUNDATION ENGINEERING
(ELECTIVE III)

Learning Objectives:
Student will be able to

1. The students will able to select the best foundation solution for different types of civil engineering problems.
2. The students should be able to design deep and shallow foundations and supervise their construction.
3. To provide the students with the information they need to design foundations at the state of the art.

UNIT – I
BEARING CAPACITY OF FOOTINGS SUBJECTED TO ECCENTRIC AND INCLINED LOADING– Meyrhoffs and Hanses theories – elastic settlement of Footings embedded in sands and clays of Infinite thickness – Footings on soils of Finite thickness-Schmertamaunns 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.

Learning Outcomes:
On successful completion of this course, it is expected that students should be able to

- A student learn and able to find out the Soil Profile in a given location.
- A student able to select suitable foundation for a given structure and site.
- Expertise in the calculation of load carrying capacity of selected foundation.

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.

MALLA REDDY ENGINEERING COLLEGE
(Autonomous)

M.TECH.(STRUCTURAL ENGINEERING)	**L**	**T/P/D**	**C**
I YEAR II SEM	**3**	**1/-/-**	**3**

PRINCIPLES OF BRIDGE ENGINEERING
(ELECTIVE III)

Learning Objectives:
Student will be able to

1. Develop an understanding of and appreciation for basic concepts in proportioning and design of bridges in terms of aesthetics, geographical location and functionality
2. Develop an intuitive feeling about the sizing of bridge elements. ie. Develop a clear understanding of conceptual design.
3. Understand the load flow mechanism and identify loads on bridges
4. Carry out the design of bridge starting from conceptual design, selecting suitable bridge, geometry to sizing of its elements

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.

Learning Outcomes:
On successful completion of this course, it is expected that students should be able to

1. Apply knowledge of mathematics, science and engineering
2. Design a system, component, or process to meet desired needs such as economic,
3. environmental, social, political, ethical, health and safety, manufacturability, and
4. sustainability
5. Function on multidisciplinary teams
6. Identify, formulate and solve engineering problems
7. Use the techniques, skills and modern engineering tools necessary for engineering
8. practice

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.
4. Ponnuswamy.S",Bridge Engineering,"TataMc-Grawhill.
5. Jagadeesh.T.R.&Jayaram.M.A,"Design of bridge structures, "Prentice hall of india.

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MALLA REDDY ENGINEERING COLLEGE
(Autonomous)

M.TECH.(STRUCTURAL ENGINEERING)	**L**	**T/P/D**	**C**
I YEAR II SEM	**3**	**1/-/-**	**3**

ANALYSIS AND DESIGN OF SHELLS & FOLDED PLATES
(ELECTIVE IV)

Learning Objectives:
Student will be able to

1. To enable the student analyse and design thin shell structures including domes, hyperbolic, paraboloid, elliptic and cylindrical shells
2. To enable the student formulate Finite Element Equations for solution of the structural response of plate bending problems

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.

Learning Outcomes:
On successful completion of this course, it is expected that students should be able to

1. analyse and design thin shell structures including domes, hyperbolic, parabolic, elliptic and cylindrical shells
2. formulate Finite Element Equations for solution of the structural response of plate bending problems and obtain solutions to shell structures

TEXT BOOKS:

1. Analysis and design of concrete shell roofs By G.S.Ramaswami.
2. Design of concrete shell roofs 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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MALLA REDDY ENGINEERING COLLEGE
(Autonomous)

M.TECH.(STRUCTURAL ENGINEERING)	**L**	**T/P/D**	**C**
I YEAR II SEM	**3**	**1/-/-**	**3**

EARTHQUAKE RESISTANT DESIGN OF BUILDINGS
(ELECTIVE IV)

Learning Objectives:

Student will be able to

1. Understand possible causes for the movements of the plates.
2. Describe elastic rebound theory as it is related to seismic activity.
3. Distinguish between earthquake magnitude and earthquake damage (intensity).
4. Understand the Static and Dynamic methods (Response Spectrum Analysis Method) for
5. Earthquake resistant R/C Buildings

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.

Learning Outcomes:

On successful completion of this course, it is expected that students should be able to

1. Predict damage to un-reinforced masonry buildings and identify the vulnerable features.
2. Employ the Response Spectrum Analysis Method and static equivalent method for
3. Earthquake resistant R/C Buildings.
4. Apply ductility requirements for the design of structural components.
5. Assess existing building structures and provide plans for their effective retrofitting.
6. Assess seismic performance of non-structural components and building contents and identify effective measures to mitigate potential damage.

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 & Bros
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:

1. IS: 1893 (Part-1) -2002. "Criteria for Earthquake Resistant – Design of structures." B.I.S., New Delhi.
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.

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MALLA REDDY ENGINEERING COLLEGE
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M.TECH.(STRUCTURAL ENGINEERING)	**L**	**T/P/D**	**C**
I YEAR II SEM	**3**	**1/-/-**	**3**

PLASTIC ANALYSIS AND DESIGN
(ELECTIVE IV)

Learning Objectives:
Student will be able to
1. Know the static and kinematic methods of plastic analysis.
2. Analyze the continuous beams of uniform & different c/s.
3. Analyze the single span frames and gable frames.
4. Find out the deflections at working load & ultimate load

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.

Learning Outcomes:
On successful completion of this course, it is expected that students should be able to
1. Identify the locations of plastic hinges and understands the beam, sway and combined mechanism.
2. Design the continuous beams, frames and gable frames of uniform c/s and varying c/s.
3. Design the straight corner and haunched connections, interior beam column connections.
4. Find out the deflections of beams and 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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M.TECH.(STRUCTURAL ENGINEERING)	**L**	**T/P/D**	**C**
I YEAR II SEM	**0**	**/3/**	**3**

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.