ACADEMIC REGULATIONS
COURSE STRUCTURE
AND SYLLABUS

For

M.Tech. (Civil Engg.)

with

STRUCTURAL ENGINEERING SPECIALISATION

(Applicable for the batches admitted from 2011-12)

MALLA REDDY ENGINEERING COLLEGE

(Autonomous)

Maisammaguda, Hyderabad-500014

Affiliated to

Jawaharlal Nehru Technological University Hyderabad

Hyderabad

MALLA REDDY ENGINEERING COLLEGE

(Autonomous)

Hyderabad - 500 014 A.P.

August/September 2011

Academic Regulations 2011 for M.Tech. (Regular)

(***Effective for the students admitted into first year from the academic year 2011-2012***)

The M.Tech Degree of Malla Reddy Engineering College, Hyderabad shall be conferred on candidates by the Jawaharlal Nehru Technological University Hyderabad, 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 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), subject to reservations prescribed by the university/college 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 and completes it successfully for not less than two academic years and not more than four academic years.

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 minimum instruction for each semester 90 clear instruction days.

3.0 A. COURSE OF STUDY:

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

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1. Computer Science and Engineering
2. Control Systems
3. Control Engineering
4. Structural Engineering
5. Thermal Engineering
6. Digital Systems & Computer Electronics

and any other course as approved by the authorities of the university/college from time to time.

3.0 B. Departments offering M. Tech Programs with Specializations mentioned below:

Civil Engineering Department	Structural Engineering
Computer Science & Engg. Department	Computer Science & Engg.
Electrical Electronics Engg. Department	Control Systems
-do-	Control Engineering
Electronics & Communication Engineering Department	Digital Systems & Computer Electronics
Mechanical Engineering Department	Thermal Engineering

4.0 ATTENDANCE:

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

4.1 A candidate shall be deemed to have eligibility to write end semester examinations in a subject if he has put in at least 75% of attendance in that subject.

4.2 Shortage of attendance up to 10% in any subject (i.e. 65% and above and below 75%) may be condoned by the College Academic Committee on genuine and valid reasons on representation by the candidate with supporting evidence.

4.3 A candidate shall get minimum required attendance at least in three (3) 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.

4.4 Shortage of attendance below 65% shall **in no case be condoned**.

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

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 practical, 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, 40 marks shall be awarded based on the Internal Evaluation. The internal evaluation shall be made based on the better 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 for a total of 30 marks. Each mid term examination shall be conducted for a duration of 120 minutes with 4 questions to be answered out of 6 questions. In addition, there shall be two assignments evaluated for 10 marks each and average of the two taken as the final assignment mark. The sum of the best of the two mid examinations and the assignment marks obtained shall be the final marks for internal evaluation.

5.2 For practical subjects, 60 marks shall be awarded based on the performance in the End Semester Examinations, 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 Semesters. 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 Committee. The Departmental Committee consists 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% 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 in that area of specialisation. The Comprehensive Viva-Voce is aimed to assess the students' understanding in various subjects he/she studies during the M.Tech course of study. The Comprehensive Viva-Voce is valued 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 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 5.4) he has to reappear for the End 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 he has failed in the end examination. In such case candidate must re-register for the subject(s) and secure required minimum attendance. Attendance in the re-registered subject(s) has to be calculated separately to become eligible to write the end

examination in the re-registered subject(s). The attendance of re-registered subject(s) shall be calculated separately to decide upon the eligibility for writing the end examination in those subject(s). In the event of taking another chance, the internal marks and end examination marks obtained in the previous attempt are nullified.

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

5.8 Laboratory examination for M.Tech courses must be conducted with two Examiners, one of them being Laboratory Class Teacher and second examiner shall be other Laboratory Teacher or any other member from inside/outside of the college.

6.0 EVALUATION OF PROJECT/ DISSERTATION WORK:

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

6.1 A Project Review Committee (PRC) shall be constituted with Principal as chair person Heads of all the Departments which are offering the M.Tech programs 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 Committee for its approval. Only after obtaining the approval of Departmental Committee the student can initiate the Project work.

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 so, his date of registration for the project work starts from the date of change of Supervisor or 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 / School/ 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 5 examiners to the Principal 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 favorable, 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 candidates work as:

A. Excellent
B. Good
C. Satisfactory
D. Unsatisfactory

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.

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 marks memorandum)

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:

Candidate who have discontinued or have been detained for want of attendance or who have failed after having undergone the course are eligible for admission to the same or equivalent subjects as and when subjects are offered, subject to rule 5.5 and 2.0 of these 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 University/College.

10.4 Wherever the word he, him or his occur, it will also include she, her and hers.

10.5 There shall be no transfers within the constituent colleges of Jawaharlal Nehru Technological University.

MALLA REDDY ENGINEERING COLLEGE (Autonomous)
M.Tech (STRUCTURAL ENGINEERING)
COURSE STRUCTURE

Semester-I

S. No.	Code	Group	Subject	L	T	P	Int. Eval.	End Exam	Tot-al
1	MA511101	Core	Computer Oriented Numerical Methods	3	1	0	40	60	100
2	SE511102		Theory of Elasticity and Plasticity	3	1	0	40	60	100
3	SE511103		Theory and Analysis of Plates	3	1	0	40	60	100
4	SE511104		Advanced Reinforced Concrete Design	3	1	0	40	60	100
5	SE511105 SE511106 SE511107	Elective -I	1.Advanced Concrete Technology 2.Optimization Techniques in Structural Engineering 3.Experimental Stress Analysis	3	1	0	40	60	100
6	SE511108 SE511109 SE511110	Elective -II	1.Advanced Structural Analysis 2.Computer Aided Design in Structural Engineering (CAD) 3.Composite Materials	3	1	0	40	60	100
7	SE511111		Advanced Concrete Laboratory	0	0	3	40	60	100
8	SE511112		Seminar	0	0	3	50	-	50
			Total Marks						**750**

Semester-II

S. No.	Code	Group	Subject	L	T	P	Int. Eval.	End Exam	Tot-al
1	SE521101	Core	Finite Element Methods	3	1	0	40	60	100
2	SE521102		Structural Dynamics	3	1	0	40	60	100
3	SE521103		Soil Dynamics and Foundation Engineering	3	1	0	40	60	100
4	SE521104		Advanced. Steel Design	3	1	0	40	60	100
5	SE521105 SE521106 SE521107	Elective -III	1.Prestressed Concrete 2.Advanced Foundation Engineering 3.Principles of Bridge Engineering	3	1	0	40	60	100
6	SE521108 SE521109 SE521110	Elective -IV	1.Analysis and Design of Shells and Folded Plates 2.Earthquake Resistant Design of Buildings 3.Plastic Analysis and Design	3	1	0	40	60	100
7	SE521111		CAD Laboratory	0	0	3	40	60	100
8	SE521112		Seminar	0	0	3	50	-	50
		Total Marks							**750**

Semester-III

S.No.	Code	Group	Subject	L	T	P	Int. Eval.	End Exam	Tot-al
1	SE531101	Core	Project Seminar	-	3	-	-	-	-
2	SE531102		Comprehensive Viva	-	-	-	-	100	100
			Total Marks				-	100	100

Semester-IV

Code	Subject	L	T	P	End Exam
CS611102	Project work & Seminar	-	-	-	Grade

L =Lectures; T=Tutorials; P=Practicals ; C=Credits

2011-2012 **MA511101**

MALLA REDDY ENGINEERING COLLEGE
(Autonomous)

M. Tech. I Year. I Semester

L	T/P/D	C
3	1/-/-	3

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.

TEXT BOOKS/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.

2011-2012 **SE511102**

MALLA REDDY ENGINEERING COLLEGE
(Autonomous)

M. Tech. I Year. I Semester

L	T/P/D	C
3	1/-/-	3

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 – dimensional 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.

TEXT BOOKS

1. Theory of Elasticity by Gurucharan Singh
2. Theory of Elasticity by Timeshanko, McGrawhill Publications.

REFERENCES

1. Theory of Plasticity by J.Chakarbarthy, McGrawhill Publications.
2. Theory of Elasticity by Y.C.Fung.

2011-2012 **SE511103**

MALLA REDDY ENGINEERING COLLEGE
(Autonomous)

M. Tech. I Year. I Semester

L	T/P/D	C
3	1/-/-	3

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.

TEXT BOOKS

1. Theory of Plates by Chandrasekhar, University Press.
2. Plate Analysis by N. K. Bairagi, Khanna Publishers. New Delhi.

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.

2011-2012 **SE511104**

MALLA REDDY ENGINEERING COLLEGE
(Autonomous)

M. Tech. I Year. I Semester

L	T/P/D	C
3	1/-/-	3

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. Advanced Reinforced Concrete Design – P.C. Varghese, Practice Hall, 2008
2. 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.

2011-2012 **SE511105**

MALLA REDDY ENGINEERING COLLEGE
(Autonomous)

M. Tech. I Year. I Semester **L T/P/D**
3 1/-/-

ELECTIVE- I
ADVANCED CONCRETE TECHNOLOGY

UNIT I

Cement: chemical composition – Bogues compounds – heat of hydration – influence of compound composition on properties of cement – Admixtures – mineral and chemical admixtures – dosage – 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.

2011-2012 **SE511106**

MALLA REDDY ENGINEERING COLLEGE
(Autonomous)

M. Tech. I Year. I Semester **L T/P/D**
3 1/-/-

ELECTIVE-I
OPTIMIZATION TECHNIQUES IN STRUCTURAL ENGINEERING

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 - radient 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.

TEXT BOOKS

1. Optimization: Theory and Applications by S.S.Rao.
2. Introduction to Optimum Design by J.S.Arora.

REFERENCES

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

2011-2012 **SE511107**

MALLA REDDY ENGINEERING COLLEGE
(Autonomous)

M. Tech. I Year. I Semester **L T/P/D**
3 1/-/-

ELECTIVE -I
EXPERIMENTAL STRESS ANALYSIS

UNIT I

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

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

UNIT II

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

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

UNIT III

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

UNIT IV

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

UNIT V

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

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TEXT BOOKS

1. Experimental Stress Analysis by Dr. Sadhu Singh

REFERENCES

1. Experimental Stress Analysis by J.W.Dally and W.F.Riley
3. Experimental Stress Analysis by Dove and Adams

2011-2012 **SE511108**

MALLA REDDY ENGINEERING COLLEGE
(Autonomous)

M. Tech. I Year. I Semester **L T/P/D**
3 1/-/-

ELECTIVE- II

ADVANCED STRUCTURAL ANALYSIS

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

A special analysis procedure - 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.

TEXT BOOKS

1. Structural Analysis by Ghali and Neyveli.
2. Matrix Analysis of Frames structures by William Weaver J.R and James M.Geve, CBS publications.

REFERENCES

1. Advanced Structural Analysis by Ashok.K.Jain, New Channel Brothers.
2. Matrix Structural Analysis by Kanchi.
3. Matrix Methods of Structural Analysis by J.Meek.

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ELECTIVE-II
COMPUTER AIDED DESIGN IN STRUCTURAL ENGINEERING

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 expert system-stages in expert system development-knowledge representation-inference mechanisms-applications.

TEXT BOOKS/REFERENCES

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

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ELECTIVE II
COMPOSITE MATERIALS

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.

TEXT BOOKS/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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ADVANCED CONCRETE TECHNOLOGY LABORATORY (ACT LAB)

A minimum of 10 experiments have to be conducted

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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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

Isoperimetric 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 isoperimetric 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.

TEXT BOOKS

1. Finite element analysis, theory and progarmming by GS Krishna Murthy.
2. Introduction to Finite element Method by Tirupathi Chandra Patila and Belugunudu.

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. Introduction to Finite element Method by JN Reddy.

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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.

TEXT BOOKS

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

REFERENCES

1. Dynamics of Structures by Anil K. Chopra, Pearson Education (Singapore), Delhi.
2. 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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SOIL DYNAMICS AND FOUNDATION 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.

TEXT BOOKS
Soil Mechanics & Foundation Engineering by B.C. Punmia.
Analysis and Design of Foundation and retaining structures-Sham Sher Prakets, Etal.
Vibration of Soils & Foundations – Richant Hall & Woods.

REFERENCES:
Hand Book of Machine Foundations by S. Srinivasulu and Vaidganathan.

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ADVANCED STEEL DESIGN

ELASTIC DESIGN

(1) **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.

(2**)** **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;

(3) **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:

(4) 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.

(5) 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.

TEXT BOOKS

1. Design of Steel Structures. P.Dayaratnam
2. Plastic Analysis of structures by B.G.Neal
3. Design of steel Structures by B.C. Punmia

REFERENCES

1. Design Steel Structures by Gaylord and Gaylord.
2. Structural Engineer's Hand Book by Merrit
3. Design of steel structures. Vol.II by Dr. RAmachandra
4. Structural Design & Drawing by N. Krishna Raju
5. Plastic Design by Beedal.

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ELECTIVE III
PRE-STRESSED CONCRETE

UNIT I

General Principles of Pre-stressed 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 maximum deflections.

UNIT IV

Transfer of Prestress in Pretension 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)

TEXT BOOKS

1. Prestressed Concrete by Krishna Raju,
2. Prestressed Concrete Structures Dr. Amlan K Sengupta and Prof. Devdas Menon

REFERENCES

1. Design of Prestressed Concrete by R.I.Gilbert & N.C.Mickleborough, Spon Press is an imprint of the Taylor & Francis Group, 2005
2. Design of prestress concrete structures by T.Y. Lin and Burn, John Wiley, New York.
3. Prestressed Concrete Design by M.K.Hurst , Taylor & Francis e-Library,. Second edition, 2003

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ELECTIVE III
ADVANCED FOUNDATION ENGINEERING

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.

TEXT BOOKS

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

REFERENCES

1. Soil Mechanics & Foundation Engineering, Foundation Engineering – II by V.N.S. Murthy.
2. Foundation Engineering Hand Book-McGraw-Hill Companies, Inc, 2006
3. An Introduction to Geotechnical Engineering by Robert D. Holtz and William D. Kovacs, Prentice Hall Eaglewood Cliffs, New Jersy, 07632, 1981

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ELECTIVE III
PRINCIPLES OF BRIDGE ENGINEERING

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.

TEXT BOOKS

1. Design of Concrete Bridges by M.G.Aswani, V.N.Vazirani and M.M.Ratwani.
2. Concrete Bridge Design and Practice by V.K.Raina.

REFERENCES

1. Bridge Deck Behaviour by E.C.Hambly
2. RCC Bridge Design by N. Krishna Raju

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ELECTIVE IV
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 roofs By Chaterjee.

REFERENCES:

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

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ELECTIVE IV
EARTHQUAKE RESISTANT DESIGN OF 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.

TEXT BOOKS/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
7. 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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ELECTIVE IV
PLASTIC ANALYSIS AND DESIGN

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

TEXT BOOKS/REFERENCES

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

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COMPUTER AIDED DESIGN LABORATORY

(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.