ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES, RAJAMPET

(AN AUTONOMOUS INSTITUTION)

Affiliated To

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR, ANANTAPUR.

ACADAMIC REGULATIONS COURSE STRUCTURE

AND DETAILED SYLLABI

for

MASTER OF TECHNOLOGY

in

STRUCTURAL ENGINEERING

M.Tech Regular Two Year P.G. Degree Course R-2014

DEPARTMENT OF CIVIL ENGINEERING

ACADEMIC REGULATIONS

Applicable for students admitted into M.Tech. Programme from 2014-15

The Jawaharlal Nehru Technological University Anantapur shall confer M.Tech. Post graduate degree to candidates who are admitted to the Master of Technology Programmes and fulfill all the requirements for the award of the degree.

1. ELIGIBILITY FOR ADMISSIONS:

Admission to the above programme shall be made subject to the eligibility, qualifications and specialization prescribed by the competent authority for each programme, from time to time.

Admissions shall be made either on the basis of merit rank obtained by the qualifying candidates at an Entrance Test conducted by the University or on the basis of GATE/PGECET score, subject to reservations or policies framed by the Government of Andhra Pradesh policies from time to time.

2. ADMISSION PROCEDURE:

As per the existing stipulations of AP State Council for Higher Education (APSCHE), Government of Andhra Pradesh, admissions are made into the first year as follows

a) Category-A seats are to be filled by Convenor through PGECET/GATE score.

b) Category-B seats are to be filled by Management as per the norms stipulated by Government of A. P.

3. SPECIALIZATION:

The following specializations are offered at present for the M.Tech. programme.

Sl. No.	Specialization
1.	CAD/CAM
2	Machine Design
2.	Digital Electronics and Communication Systems
3.	Embedded Systems
4.	VLSI System Design
5.	Computer Science and Engineering
6.	Electrical Power Engineering
7.	Electrical Power Systems
8	Structural Engineering

and any other specialization as approved by the concerned authorities from time to time.

4. COURSE WORK:

4.1. A Candidate after securing admission must pursue the M. Tech. programme of study for four semesters duration.

4.2. Each semester shall be of 20 weeks duration including all examinations.

4.3. A candidate admitted in to the programme should complete it within a period equal to twice the prescribed duration of the programme from the date of admission.

5. ATTENDANCE

5.1. A candidate shall be deemed to have eligibility to write end semester examinations if he has put in at least 75% of attendance aggregate in all subjects/courses in the semester.

5.2. Condonation of shortage of attendance up to 10% i.e., between 65% and above and less than 75% may be granted by the Institute Academic committee.

5.3. Shortage of attendance below 65% in aggregate shall in no case be condoned.

5.4. Condonation of shortage of attendance shall be granted only on genuine and valid reasons on representation by the candidate with supporting evidence.

5.5. A stipulated fee shall be payable towards condonation of shortage of attendance to the institute as per following slab system

1st Slab: Less than 75% attendance but equal to or greater than 70% a normal condonation fee can be collected from the student.

2nd Slab: Less than 70% but equal to or greater than 65%, double the

condonation fee can be collected from the student.

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

5.7. A student will not be promoted to the next semester unless he satisfies the attendance requirements of the current semester, as applicable.

5.8. A student detained due to shortage of attendance, will have to repeat that semester when offered next.

6. CREDIT SYSTEM NORMS:

TABLE 1

	Period(s)/week	**Credits**
Theory	01	01
Practical	03	02
Seminar	01	01
Project	-	16

7. EVALUATION:

7.1 Distribution of marks

S. No	**Examination**	**Marks**	**Examination and Evaluation**	**Scheme of Evaluation**
1.	Theory	60	Semester-end examination (External evaluation)	The question paper shall be of descriptive type with 5 questions with internal choice are to be answered in 3hours duration of the examination.

<table>
<tr><th>S. No</th><th>Examination</th><th>Marks</th><th colspan="3">Examination and Evaluation</th><th>Scheme of Evaluation</th></tr>
<tr><td></td><td></td><td>40</td><td colspan="3">Mid - Examination of 120 Min. duration (Internal evaluation).
4 descriptive type questions with internal choice are to be answered and evaluated for 30 marks, and the reaming 10 marks are to be allotted for 3-5 assignments to be submitted by the student. The assignment marks are to be awarded based on the completeness of the assignment, correctness of the assignment and in-time submission, evaluated for 10 marks and average of the total assignment marks are rounded to the next integer.</td><td>Two mid-exams 30 marks each are to be conducted. Better one to be considered.
Mid-I: After first spell of instructions (I&II Units).
Mid-II: After second spell of instructions (III - V Units).</td></tr>
<tr><td rowspan="3">2</td><td rowspan="3">Laboratory</td><td>60</td><td colspan="3">Semester-end Lab Examination (External evaluation)</td><td>For laboratory courses: 3 hours duration.
One External and One Internal examiners.</td></tr>
<tr><td rowspan="2">40</td><td>30</td><td>Day to Day evaluation (Internal evaluation)</td><td></td><td>Performance in laboratory experiments.</td></tr>
<tr><td>10</td><td>Internal evaluation</td><td></td><td>Practical Tests (one best out of two tests includes viva-voce)</td></tr>
<tr><td>3</td><td>Seminar in each of the semesters. 2 hours /week</td><td>100</td><td colspan="3">Internal Evaluation
20 Marks for Report
20 Marks for subject content
40 Marks for presentation
20 Marks for Question and Answers</td><td>Continuous evaluation during a semester by the Departmental Committee (DC)</td></tr>
<tr><td rowspan="2">4</td><td rowspan="2">Project work</td><td rowspan="2">Grade A (95%)
Grade B (85%)</td><td>12 Credits</td><td>External evaluation</td><td></td><td>End Project Viva-Voce Examination by Committee as detailed under sect. 9.</td></tr>
<tr><td>4 Credits</td><td>Internal evaluation</td><td></td><td>Continuous evaluation by the DC. as detailed under sect. 9.5</td></tr>
</table>

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

7.3 A candidate has to secure a minimum of 50% to be declared successful.

7.4 In case the candidate does not secure the minimum academic requirement in any of the subjects/practical, he has to reappear for the Examination either supplementary or regular in that subject/practical along with the next batch students. A separate supplementary examinations will be conducted for the I semester students at the end of II semester.

7.5 **Revaluation / Recounting:** Students shall be permitted to request for recounting/ revaluation of the end theory examination answer scripts within a stipulated period after payment of prescribed fee. After recounting or revaluation, records are updated with changes if any and the student will be issued a revised memorandum of marks. If there are no changes, the student shall be intimated the same through a letter or a notice.

8. RE-REGISTRATION FOR IMPROVEMENT OF INTERNAL EVALUATION MARKS(for theory subjects only):

8.1 Out of the subjects the candidate has failed in the examination due to internal evaluation marks secured being less than 50%, the candidate shall be given one chance for each theory subject and for a maximum of **Three** theory subjects for improvement of internal evaluation marks.

8.2 The candidate can re-register for the chosen subjects and fulfill the academic requirements. Re-registration shall not be permitted after the commencement of class work for that semester. The candidate can re-register for 1st semester subjects when he is in his 3rd semester and for 2nd semester subjects when he is in his 4th semester else the candidate can re-register after completion of 2 years course work.

8.3 For each subject re-registered, the candidate has to pay a fee equivalent to one third of the semester tuition fee.

8.4 In the event of re-registration, the internal evaluation marks as well as the End Examinations marks secured in the previous attempt(s) for those subjects stand cancelled.

9. EVALUATION OF PROJECT WORK:

Every candidate shall be required to submit thesis/dissertation after taking up a topic approved by the Departmental Committee.

9.1 The Departmental Committee (DC) consisting of HOD, Project supervisor and two internal senior experts shall monitor the progress of the project work. A Project Review Committee (PRC) shall be constituted with Principal as Chair Person, Heads of the departments of the M.Tech Programs and Two other senior faculty members, as members of the PRC. PRC will come into action when the DC is not able to resolve the issues.

9.2 Registration of Project work: A candidate is permitted to register for the project work after satisfying the attendance requirement of all the courses (theory, practical and seminar of I & II semesters).

9.3 After satisfying 9.2, a candidate has to submit, in consultation with his project supervisor, the title, objective and plan of action of his project work to the DC for approval. Only after obtaining the approval of DC, the student can initiate the project work.

9.4 The work on the project shall be initiated in the penultimate semester and continued in the final semester. The duration of the project is for two semesters. The candidate can submit Project thesis with the approval of DC after 36 weeks from the date of registration at the earliest but not later than one calendar year from the date of registration for the project work. Extension of time within the total permissible limit for completing the programme is to be obtained from the Head of the Institution.

9.5 The Internal Evaluation shall be made by the DC to grade, on the basis of two seminars presented by the student on the topic of his project.

9.6 The student must submit status report at least in two different phases during the project work period. These reports must be approved by the DC before submission of the Project Report.

9.7 A candidate shall be allowed to submit the thesis / dissertation only after passing all the prescribed subjects (theory, practical, seminar and project work internal evaluation).

9.8 A candidate has to prepare four copies of the thesis/dissertation certified in the prescribed format by the supervisor and HOD. Out of which three copies shall be submitted in the examination section.

9.9 Viva-voce examination shall be conducted by a board consisting of the supervisor, Head of the department and the examiner. The board shall jointly report candidate's work as.

A Very Good performance

B Moderate Performance

C Failure Performance

Head of the Department shall coordinate and make arrangements for the conduct of viva-voce.

If the report of the viva-voce is failure performance, 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.

10. CREDIT POINT AVERAGE AND CUMULATIVE CREDIT POINT AVERAGE:

10.1. CREDIT POINT AVERAGE (CPA):

$$\textbf{CPA} = \frac{\sum_i C_i T_i}{10\sum_i C_i}$$

Where C_i= Credits earned for Course i in any semester/year.

T_i= Total marks obtained for course i in any semester/year.

10.2. CUMULATIVE CREDIT POINT AVERAGE (CCPA):

$$\textbf{CCPA} = \frac{\sum_n \sum_i C_{ni} T_{ni}}{10 \sum_n \sum_i C_{ni}}$$

Where ***n*** refers to the semester in which such courses were credited.

The CCPA is awarded only when a student earns all the credits prescribed for the programme.

10.3. OVERALL PERFORMANCE:

CCPA	Classification of Final Results
7.0 and above	First Class with Distinction
6.0 and above but below 7.0	First Class
5.0 and above but below 6.0	Second Class

11. TRANSCRIPTS:

After successful completion of the entire programme of study, a transcript containing performance of all the academic years will be issued as a final record. Duplicate transcripts will be issued if required, after payment of requisite fee. Partial transcript will also be issued up to any point of study to a student on request.

12. ELIGIBILITY:

A student shall be eligible for the award of M.Tech Degree if he fulfills all the following conditions:

i. Registered and successfully completed all the components prescribed in the programme of study to which he was admitted.
ii. Successfully acquired all **72 credits** as specified in the curriculum corresponding to the branch of his study within the stipulated time.
iii. No disciplinary action is pending against him.

13. AWARD OF DEGREE:

The Degree will be conferred and awarded by Jawaharlal Nehru Technological University Anantapur, Anantapur on the recommendations of the Principal, AITS (Autonomous) based on the eligibility as mentioned in clause 11.

14. WITHHOLDING OF RESULTS:

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

15. TRANSITORY REGULATIONS:

Candidates who have discontinued or have been detained for want of attendance or who have failed after having undergone the course in earlier regulations and wish to continue the course are eligible for admission into the unfinished semester from the date of commencement of class work with the same or equivalent subjects as and when subjects are offered. Whereas, he continues to be in the academic regulations he was first admitted.

16. AMENDMENTS OF REGULATIONS:

The Chairman, Academic Council of Annamacharya Institute of Technology and Sciences, Rajampet (Autonomous) reserves the right to revise, amend, or change the Regulations, Scheme of Examinations and/or Syllabi or any other policy relevant to the needs of the society or industrial requirements etc., without prior notice.

17. GENERAL:

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

18. Any legal issues are to be resolved in Rajampet Jurisdiction.

I year I semester

Subject Code	Subject	Hours/ Week		C	Maximum marks		
		L	P		Internal	External	Total
4PEC14	Computational Methods	4	0	4	40	60	100
4PT611	Matrix Methods of Structural Analysis	4	0	4	40	60	100
4PT612	Theory of Elasticity	4	0	4	40	60	100
4PT613	Theory and Analysis of Plates	4	0	4	40	60	100
ELECTIVE –I		4	0	4	40	60	100
4PT614	Experimental Stress Analysis						
4PT615	Advanced Reinforced Concrete Design						
4PT616	Cost Effective Housing Techniques						
ELECTIVE –II		4	0	4	40	60	100
4PT617	Prestressed concrete						
4PT618	Maintenance and Rehabilitation of Structures						
4PT619	Advanced Foundation Engineering						
4PT61A	Advanced Concrete Technology Lab	0	3	2	40	60	100
4PT61B	Seminar-I	0	2	2	100	00	100
Total		**24**	**8**	**30**	**380**	**420**	**800**

I year II semester

Subject Code	Subject	Hours/ Week		C	Maximum marks		
		L	P		Internal	External	Total
4PT621	Structural dynamics	4	0	4	40	60	100
4PT622	Finite element analysis of structures	4	0	4	40	60	100
4PT623	Stability of structures	4	0	4	40	60	100
4PT624	Analysis of Shells folded plates	4	0	4	40	60	100
ELECTIVE –III							
4PT625	Design of bridges						
4PT626	Advanced concrete technology	4	0	4	40	60	100
4PT627	Earthquake Resistance structures						
ELECTIVE –IV							
4PT628	Advanced steel design						
4PT629	Building construction management	4	0	4	40	60	100
4PT62A	Fracture mechanics						
4PT62B	CAD laboratory	0	3	2	40	60	100
4PT62C	Seminar-II	0	2	2	100	00	100
Total		**24**	**8**	**30**	**380**	**420**	**800**

III & IV SEMESTERS:

Subject Code	Course Name	Credits	Maximum marks		
			Internal	External	Total
4P7231	**PROJECT WORK**	**16**	**GRADE (A/B/C)**		
	TOTAL	**16**	**GRADE**		

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M.Tech (CE) I Semester

COMPUTATIONAL METHODS

UNIT I

Solving sets of Linear equations – Matrix notation – Iterative methods – Relaxation methods – System of non-linear equations.

Numerical integration: Newton-Cotes integration formulae – Simpson's rules, Romberg Integration, Gaussian quadrature.

UNIT II

Boundary value problems: Finite difference method,TheShooting method, the cubic spline method

Numerical solutions of partial differential equations: Laplace's equation – Representation as a difference equation – Iterative methods for Laplace's equation – Poisson equation – Examples– ADI method.

UNIT III

Parabolic partial differential equations: Explicit method – Crank-Nickolson method — Stability and convergence criteria –

Hyperbolic partial differential equations: Solving wave equation by finite differences-stability of numerical method –Derivative boundary condition.

UNIT IV

Finite element method- introduction, methods of approximation, Rayleigh Ritz method, Galerkin method, Application to two dimensional problems.

UNIT V

Programming in MATLAB: Basics- Script files – Graphics, 2D Plots, 3D Plots – input/output in Matlab.

Numerical Methods Using MATLAB: Gauss Elimination method, Gauss Seidel Method, Gauss Jacobi Method.

Text Books:

1. Introductory methods of numerical analysis, SS Sastry, PHI
2. MATLAB: An introduction with applications, Rao V. Dukkipati, New Age International.

References:

1. Numerical Methods for Engineers, Steven C.Chapra, Raymond P.Canale, Tata Mc-Graw hill
2. Applied Numerical Methods with MATLAB for engineers and scientists, Steven Chapra, Tata McGrawHill.
3. Applied numerical analysis, Curtis F.Gerald, partick.O.Wheatly, Addison-wesley,1989
4. Numerical methods, Douglas J..Faires,Riched Burden, Brooks/cole publishing Company, 1998.Second edition.

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M.Tech (CE) I Semester

MATRIX METHODS OF STRUCTURAL ANALYSIS

UNIT-I

INTRODUCTION:-Indeterminacy-Determination of static and kinematic indeterminacies of two-dimensional and three-dimensional portal frames, pin jointed trusses and hybrid frames-coordinate systems –structural idealization. Introduction To Matrix Methods Of Analysis-Flexibility and stiffness matrices-Force displacement relationships for axial force, couple, tensional moments – stiffness method of analysis and flexibility method of analysis.

UNIT-II

ANALYSIS OF CONTINUOUS BEAMS- stiffness method and flexibility method of analysis –continuous beams of two and three spans with different end conditions-internal hinges.

UNIT-III

ANALYSIS OF TWO DIMENSIONAL PORTAL FRAMES & PINJOINTED TRUSSES – stiffness and flexibility method of analysis of 2D portal frames with different end conditions-plotting of bending moment diagrams. Computation of joint displacement and member forces for pin jointed trusses.

UNIT-IV

TRANSFORMATION OF CO-ORDINATES - Local and Global co-ordinate systems-transformation of matrices from local to global coordinates of element stiffness matrix-direct stiffness method of analysis-assembly of global stiffness matrix from element stiffness matrices –static condensation-sub-structuring.

UNIT-V

EQUATION SOLVERS-solution of system of linear algebraic equations-direct inversion method-gauss elimination method-Cholesky method-banded equation solvers-frontal solution technique.

TEXT/REFERENCE BOOKS :

1. Structural Analysis by Pundit & Gupta, Tata MC Graw Hill Book company.
2. Structural Analysis by C.S.Reddy, Tata MC Graw Hill Book company
3. Cotes, R.C., Couties, M.G., and Kong, F.K., Structural Analysis, ELBS.
4. MC.Guire, W.,and Gallagher, R.H., Matrix Structural analysis, John Wiley and sons.
5. John L.Meek., Matrix Strucstural Analysis, MC Graw Hill Book company.
6. Structural Analysis – R.C.Hibbeler, Pearson Education

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES, RAJAMPET

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M.Tech (CE) I Semester

THEORY OF ELASTICITY

UNIT-I

INTRODUCTION TO PLANE STRESS AND PLANE STRAIN ANALYSIS:

Elasticity –Notation for forces and stresses-Components of stresses –components of strain – Hooke's law.Plane stress-plane strain-Differential equations of equilibrium- Boundary conditions- Compatability equations-stress function-Boundary conditions.

UNIT-II

TWO DIMENSIONAL PROBLEMS IN RECTANGULAR COORDINATES:

Solution by polynomials-Saint Venant's principle-Determination of displacements-bending of simple beams-application of Fourier series for two dimensional problems - gravity loading.

UNIT-III

TWO DIMENSIONAL PROBLEMS IN POLAR COORDINATES :

General Equation in polar co-ordinates - 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 the general solution of two dimensional problem in polar coordinates-Application of the general solution in polar coordinates.

UNIT-IV

ANALYSIS OF STRESS AND STRAIN IN THREE DIMENSIONS: Principle stress - ellipsoid and stress-director surface-Determination of principle stresses- Maximum shear stresses-Homogeneous deformation-principle axis of strain rotation.

GENERAL THEOREMS:

Balance laws - Differential equations of equilibrium- conditions of compatibility - Determination of displacement-Equations of equilibrium in terms of displacements-principle of superposition-Uniqueness of solution –the Reciprocal theorem.

UNIT-V

TORSION OF PRISMATICAL BARS:

Torsion of prismatic bars- Elliptical cross section-other elementary solutions-membrane anology-Torsion of rectangular bars-solution of torsional problems by energy method-use of soap films in solving torsionol problems-hydra dyanmical analogies-Torsion of shafts, tubes, bars etc.

TEXT/REFERENCE BOOKS :

1. Theory of Elasticity and Plasticity by Timoshenko, S., MC Graw Hill Book company.
2. Advnced Strength of materials by Papoov, MC Graw Hill Book company.
3. Theory of Elasticity and Plasticity by Sadhu Singh. Khanna Publishers.
4. Chen, W.F. and Han, D.J.Plasticity for structural Engineers, Springer – Verlag, New York.
5. Lubliner, J., Plasticity theory, Mac Millan Publishing Co., New York.
6. Foundations of Solid Mechanics by Y.C.Fung, PHI Publications.
7. Advanced Mechanics of Solids by L.S. Srinath, Tata MC Graw Hill Book company.

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES, RAJAMPET

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M.Tech (CE) I Semester

THEORY AND ANALYSIS OF PLATES

UNIT-I

DERIVATION OF PLATE EQUATIONS FOR RECTANGULAR PLATES –In plane bending and transverse bending effects.Plates under various loading conditions like concentrated, U.D.L and hydrostatic pressure- Navier and Levy's type of solutions for various boundary conditions.

UNIT-II

CIRCULAR PLATES: Symmetrically loaded, circular plates under various loading conditions, annular plates.

UNIT-III

PLATES UNDER SIMULTANEOUS BENDING AND STRECTHING: Derivation of the governing equation and application to simple cases.

UNIT-IV

ORTHOTROPIC PLATES: Derivation of the governing equation, applications to grillage problems as equivalent orthotropic plates.

UNIT-V

NUMERICAL AND APPROXIMATE METHODS: Energy solutions by variational methods, finite difference and finite element methods of analysis for plate problems.Study of few simple cases for large deflection theory of plates.

REFERENCE BOOKS:

1. Timoshenko, S., and Krieger, S.W., Theory of plates and shells, Mc Graw Hill Book company.
2. Theory of plates by Chandrashekhara, K, Universities Press ltd
3. Szilard, R., Theory and Analysis of Plates, Prentice Hall Inc.
4. N.K.Bairagi, Plate analysis, Khanna Publishers, Delhi, 1986.

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES, RAJAMPET

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M.Tech (CE) I Semester

EXPERIMENTAL STRESS ANALYSIS

(Elective-I)

UNIT-I

PRINCIPLES OF EXPERIMENTAL APPROACH:-

Merits 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 of experimental Determinations Properties of Strain-Gauge Systems-Types of Strain Gauges –Mechanical, Acoustic and Optical Strain Gauges.Introduction to Electrical strain gauges - Inductance strain gauges – LVDT – Resistance strain gauges – various types –Gauge factor – Materials of adhesion base. Introduction to strain rosettes the three element Rectangular Rosette – The Delta Rosette – Corrections for Transverse Strain Gauge.

UNIT-III

NON – DESTRUCTIVE TESTING & BRITTLE COATING METHODS :-

Ultrasonic Pulse Velocity method –Application to Concrete . Hammer Test – Application to Concrete.Introduction –Coating Stress – Failure Theories –Brittle Coating Crack Patterns – Crack Detection –Types of Brittle Coating – Test Procedures for Brittle Coating Analysis – Calibration Procedures – Analysis of Brittle Coating Data.

UNIT-IV

THEORY OF PHOTOELASTICITY :- Introduction –Temporary Double refraction – The stress Optic Law –Effects of stressed model in a polariscope for various arrangements – Fringe Sharpening. Brewster's Stress Optic law.

UNIT-V

TWO DIMENSIONAL PHOTOELASTICITY :- Introduction – Isochramic Fringe patterns- Isoclinic Fringe patterns passage of light through plane Polariscope and Circular polariscope Isoclinic Fringe patterns – Compensation techniques – Calibration methods – Separation methods – Scaling Model to prototype Stresses – Materials for photo – Elasticity Properties of Photoelastic Materials.

Reference Books :-

1.Experimental stress analysis by J.W.Dally and W.F.Riley, College House Enterprises

2. Experimental stress analysis by Dr.Sadhu Singh.khanna Publishers

3.Experimental Stress analysis by U.C.Jindal, Pearson Pubilications.

4. Experimental Stress Analysis by L.S.Srinath, MC.Graw Hill Company Publishers.

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M.Tech (CE) I Semester

ADVANCED REINFORCED CONCRETE DESIGN

(ELECTIVE – I)

UNIT-I

Deflection of Reinforced concrete beams and Slabs:

Introduction -Short-term Deflection of beams and Slabs -Deflection due to -Imposed loads - Short- term deflection of beams due to applied loads- Calculation of deflection by IS 456 - Calculation of deflection by BS 8110 - Deflection calculation by Eurocode - ACI Simplified Method - Deflection of continues beams by IS 456 - Deflection of Cantilevers - Deflection of Slabs.

Estimation of Crackwidth in Reinforced Concrete Members: Introduction - Factors affecting Crackwidth in beams - Mechanism of Flexural cracking Calculation of crack widths - Simple Empirical method - Estimation of Crackwidth in -beams by IS 456 of BS 8110 - Shrinkage and Thermal Cracking

UNIT-II

Design of Reinforced Concrete Deep Beams:

Introduction - Minimum Thickness - Steps of Designing deep beams - Design by IS 456 - Design according to British Practice - ACI Procedure for design of deep beams - Checking for local failures - Detailing of deep beams

UNIT-III

Shear in Flat Slabs and Flat Plates:

Introduction - Checking for One-way (wide beam) shear - Two-way (Punching) shear Permissible punching shear - Shear due to Unbalanced Moment (Torsional moments) Calculation of j values - Strengthening of column areas for moment transfer by torsion which produces shear - Shear Reinforcement Design - Effect of openings in Flat slabs - Recent Revisions in ACI 318 - Shear in Two – way Slabs with beams.

UNIT-IV

Design of plain concrete walls & Shear walls:

Introduction - Braced and Unbraced walls - Slenderness of walls- Eccentricities of vertical loads at Right angles to wall - Empirical design method for plane concrete walls carrying axial load - Design of walls for In-plane Horizontal forces - Rules for detailing of steel in concrete wallsIntroduction - Classification of shear walls - Classification according to behavior - Loads in shear walls - Design of Rectangular and flanged shear walls - Derivation of formula for moment of Resistance of Rectangular shear walls

UNIT-V

Design of Reinforced Concrete Members for Fire Resistance:

Introduction - ISO 834 standard heating conditions- Grading or classifications - Effect of High temperature on steel and concrete - Effect of high temperatures on different types of structural members - Fire resistance by structural detailing from Tabulated data - Analystical determination of the ultimate bending moment capacity of reinforced concrete beams under fire - Other considerations

TEXT/REFERENCE BOOKS :

1. P.Purushothaman, Reinforced concrete Structural Elements: Behaviour, analysis and Design, TATA MC Graw Hill.
2. C.E. Reynolds and J.C. Steedman, Reinforced Concrete Desigers Hand bood, A view point publication.
3. Limit State Design of Reinforced Concrete Structures by P.Dayaratnam, Oxford & IBH Publishers, 2004 edition.
4. Advanced RCC by N.Krishna Raju, CBS Publishers & Distributors.
5. Reinforced cement concrete Structures – Devadas Menon, TATA MC Graw Hill.

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M.Tech (CE) I Semester

Cost Effective Housing Techniques

ELECTIVE –1

UNIT-I

a) **Housing Scenario**

Introducing - Status of urban housing - Status of Rural Housing

b) Housing Finance:

Introducing - Existing finance system in India - Government role as facilitator - Status at Rural Housing Finance - Impedimently in housing finance and related issues

a**) Land use and physical planning for housing**

introduction - Planning of urban land - Urban land ceiling and regulation act - Efficiency of building bye lass - Residential Densities

b) Housing the urban poor

Introduction - Living conditions in slums - Approaches and strategies for housing urban poor

UNIT-II

Development and adoption of low cost housing technology

Introduction - Adoption of innovative cost effective construction techniques - Adoption of precast elements in partial prefatroices - Adopting of total prefactcation of mass housing in India- General remarks on pre cast rooting/flooring systems -Economical wall system - Single Brick thick loading bearing wall - 19cm thick load bearing masonery walls - Half brick thick load bearing wall - Flyash grypsym thick for masonry - Stone Block masonery - Adoption of precast R.C. plank and join system for roof/floor in the building

UNIT-III

Alternative building materials for low cost housing

Introduction - Substitute for scarce materials – Ferrocement - Gypsum boards - Timber substitutions - Industrial wastes - Agricultural wastes - Fitire starateru; for ,p,topm of alternative building maintenance

Low cost Infrastructure services:

Introduce - Present status - Technological options - Low cost sanitation - Domestic wall - Water supply, energy

UNIT-IV

Rural Housing:

Introduction traditional practice of rural housing continuous - Mud Housing technology Mud roofs - Characteristics of mud - Fire treatment for thatch roof - Soil stabilization - Rural Housing programs

UNIT-V

Housing in Disaster prone areas:

Introduction – Earthquake - Damages to houses - Traditional prone areas - Type of Damages and Railways of non-engineered buildings - Repair and restore action of earthquake Damaged non-engineered buildings recommendations for future constructions. Requirement’s of

structural safety of thin precost roofing units against Earthquake forcesStatus of R& D in earthquake strengthening measures - Floods, cyclone, future safety

TEXT BOOKS

1. Building materials for low –income houses – International council for building research studies and documentation.
2. Hand book of low cost housing by A.K.Lal – Newage international publishers.
3. Properties of concrete – Neville A.m. Pitman Publishing Limited, London.
4. Light weight concrete, Academic Kiado, Rudhai.G – Publishing home of Hungarian Academy of Sciences 1963.
5. Low cost Housing – G.C. Mathur.
6. Modern trends in housing in developing countries – A.G. Madhava Rao, D.S. Ramachandra Murthy & G.Annamalai.

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES, RAJAMPET

(AN AUTONOMOUS INSTITUTION)

M.Tech (CE) I Semester

PRESTRESSED CONCRETE
(ELECTIVE – II)

UNIT-I

INTRODUCTION: Development of pre-stressed concrete –Advantages and Disadvantages of PSC over RCC –General principles of pre-stressing-pre tensioning and post tensioning – Materials used in PSC-high strength concrete –High tension steel-Different types /methods/systems of pre-stressing.

UNIT-II

Losses of pre-stress: Estimation of the loss of pre-stress due to various causes like elastic shortening of concrete ,creep of concrete, shrinkage of concrete, relaxation of steel, slip in anchorage, friction etc.

UNIT-III

Flexure & Deflections: Analysis of sections for flexure in accordance with elastic theory-Allowable stresses-Design criteria as per I.S code of practice –Elastic design of Beams (rectangular, I and T sections) for Flexure –Introduction to partial pre-stressing. Introduction-Factors influencing deflections-short term and long term deflections of uncracked and cracked members.

UNIT-IV

Shear, bond, Bearing and Anchorage: shear in PSC beams –Principal stresses –Conventional elastic design for shear-transfer of pre-stress in pre-tensioned members-transmission length – Bond stresses-bearing at anchorage –Anchorage zone stresses in post-tensioned members-Analysis and design of end blocks by Guyon, Magnel and approximate methods –Anchorage zone reinforcements.

UNIT-V

Statistically indeterminate structures: Introduction –advantages and disadvantages of continuity –Layouts for continuous beams-primary and secondary moments –Elastic analysis of continuous beams-Linear transformation-Concordant cable profile-Design of continuous beams. **Circular pre-stressing**: Introduction –Circumferential pre-stressing Design of Prestressed concrete tanks –vertical pre-stressing in tanks-Dome pre-stressing.

REFERENCE BOOKS:

1. Prestressed Concrete by S. Krishna raju, TMH Pubilishers.
2. Prestressed Concrete by S. Ramamrutham, Dhanpati Rai Pubilicartions.
3. Prestressed concrete design by Praveen Nagarajan, Pearson Pubilications.
4. T.Y.Lin, Design of Prestressed Concrete Structures, Asian Publishing house, Bombay, 1953.
5. Y.Guyon, Prestressed Concrete, Vol.I&II, Wiley and Sons, 1960.
6. F.Leohhardt, Prestressed concrete Design and construction, Wilhelm Ernst and shon, Berlin, 1964.
7. C.E.Reynolds and J.C. Steedman, Reinforced concrete designers hand bood, A view point publication, 1989.
8. Edward P.Nawy, Prentice Hall – Prestressed Concrete.
9. Prestressed Concrete – by Raj Gopal, Narsoa Pubilications.

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M.Tech (CE) I Semester

MAINTENANCE AND REHABILITATION OF STRUCTURES

ELECTIVE – II

UNIT-I

Influence on serviceability and Durability:- General : Quality assurance for concrete construction, As built concrete properties, strength, permeability, volume changes, thermal properties, cracking. Effects due to climate, temperature, chemicals, wear and erosion, design and construction errors, corrosion mechanism, Effects of cover thickness and cracking methods of corrosion protection, inhibitors, resistant steels, coatings cathodic protection.

UNIT-II

Maintenance and Repair Strategies :- Inspection, Structural Appraisal, Economic appraisal, components of equality assurance, conceptual bases for quality assurance schemes.

UNIT-III

Materials for Repair :- Special concretes and mortar, concrete chemicals, special elements for accelerated strength gain, Expansive cement, polymer concrete, sulphur infiltrated concrete, ferro cement, Fibre reinforced concrete.

UNIT-IV

Techniques for Repair :- Rust eliminators and polymers coating for rebars during repair, foamed concrete, mortar and dry pack, vacuum concrete, Gunite and shotcrete Epoxy injection, Mortar repair for cracks, shoring and underpinning.

UNIT-V

Case Studies: - Repairs to overcome low member strength, Deflection, cracking, chemical disruption, weathering, wear, fire, leakage, marine exposure.

TEXT/REFERENCE BOOKS:

1. Dension Campbell, Allen and Harold Roper, Concrete Structures, Materials, Maintenance and Repair, Longman Scientific and Technical, U.K. 1991.
2. RT.Allen and S.C. Edwards, Repair of concrete Structures, Blakie and sons, UK, 1987.
3. MS. Shetty, Concrete Technology – Theory and practice, S.Chand and company, New Delhi, 1992.
4. Santhakumar, A.R.Training Course notes on damage assessment and Repair in low cost housing RHDC-NBO Anna University, Madras, July, 1992.
5. Raikar, R.N.learning from failures – deficiencies in Design, construction and service – R&D centre (SDCPL), Raikar Bhavan, Bombay, 1987.
6. N.Palaniappan, Estate Management, Anna Institute of Management, Madras Sep. 1992.
7. F.K.Garas, J.L.Clarke, GST Armer, Structural Assessment, Butterworths, UK Aporil 1987.
8. A.R. Santhakumar, Concrete chemicals – Theory and applications, Indian society for construction Engineering and Technology, Madras. 1993 (In press)

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M.Tech (CE) I Semester

ADVANCED FOUNDATION ENGINEERING

ELECTIVE – II

UNIT-I

SHALLOW FOUNDATIONS-I: General requirements of foundations. types of shallow foundations and the factors governing the selection of type of shallow foundation. Bearing capacity of shallow foundations by Terzaghi's theory and Meyerhof's theory (derivation of expressions and solution to problems based on these theories). Local shear and general shear failure and their identification

UNIT-II

SHALLOW FOUNDATIONS-II: Bearing capacity of isolated footing subjected to eccentric and inclined loads. bearing capacity of isolated footing resting on stratified soils- Button's theory and Siva reddy analysis. Analysis and structural design of R.C.C isolated, combined and strap footings.

UNIT-III

DEEP FOUNDATIONS-I: Pile foundations-types of pile foundations. estimation of bearing capacity of pile foundation by dynamic and static formulae. Bearing capacity and settlement analysis of pile groups. Negative skin Friction, Pile load tests.Sheet Pile Walls.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-IV

DEEP FOUNDATIONS-II: Well foundations-Elements of well foundation. forces acting on a well foundation. Depth and bearing capacity of well foundation. Design of individual components of well foundation (only forces acting and principles of design). Problems associated with well sinking.

UNIT-V

FOUNDATIONS IN PROBLEMATIC SOILS: Foundations in black cotton soils-basic foundation problems associated with black cotton soils. Lime column techniques-principles and execution. Under reamed piles-principle of functioning of under reamed pile-Analysis and structural design of under reamed pile. Use of Cohesive Non Swelling (CNS) layer below shallow foundations.

TEXT BOOKS:

- Analysis and Design of Foundations and Retaining Structures-Shamsher Prakash,Gopal Ranjan and Swami Saran.

Reference Books:

- Analysis and Design of Foundations-J.E.Bowles
- Foundation Design and Construction-Tomlinson
- Foundation Design-Teng.
- Geotechnical Engg – C.Venkatramaiah

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M.Tech (CE) I Semester

ADVANCED CONCRETE LABORATORY

List of Experiments:

1. Workability
    (a)Slump Test
    (b)Compaction Factor Test
    (c)Vee-Bee Test
2. Flakiness Test
3. Elongation Test
4. Specific Gravity of
    (a) Cement
    (b) Coarse Aggregate
    (c) Fine Aggregate
5. Bulk density of
    (a) Fine Aggregate
    (b) Coarse Aggregate
6. Fineness Modulus of
    (a) Fine Aggregate
    (b) Coarse Aggregate
7. Compressive strength of Cement
8. Mix Design of Concrete and Casting of Specimen.
9. Young's Modulus of Concrete
10. Fineness by Blain's apparatus for cement, fly ash, Silica.

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M.Tech (CE) II Semester

STRUCTURAL DYNAMICS

UNIT-I

Theory of Vibrations: Introduction –Elements of a vibratory system – degrees of freedom-continuous systems –lumped mass idealization –Oscillatory motion –Simple harmonic motion –pictorial representation of S.H.M - free vibrations of single degree of Freedom (SDOF) systems –undamped and Damped –Critical damping –Logarithmic decrement –Forced vibrations of SDOF systems-Harmonic excitation –Dynamic magnification factor-Bandwidth.Fundamental objective of dynamic analysis-types of prescribed loading- Methods of discretization- Formulation of the equations of motion.

UNIT-II

Single degree of Freedom System: Formulation and solutions of the equation of motion - free Vibration response –response to harmonic, periodic, Impulsive and general Dynamic loading – Duhamel integral

UNIT-III

Multi Degree of Freedom System: selection of the degree of freedom –Evaluation of structural property matrices-Formulation of the MDOF equations of motion –Undamped free vibrations-Solution of Eigen value problem for natural frequencies and mode shapes- Analysis of dynamic response –Normal coordinates –Uncoupled equations of motion –Orthogonal properties of normal modes-mode superposition procedure

UNIT-IV

Practical vibration analysis: Stodola method- Fundamental mode analysis –analysis of second and higher modes –Holzer's method –basic procedure –transfer matrix procedure

UNIT-V

Introduction to Earthquake analysis: Introduction –Excitation by rigid base translation – Lumped mass approach -SDOF and MDOF system- I.S code methods of analysis.**Continuous system:** Introduction –Flexural vibrations of beams- Elementary case-Equation of motion – Analysis of undamped free shapes of simple beams with different end conditions-principles of application to continuous beams.

REFERENCE BOOKS:

- A.K.Chopra, "Structural Dynamics for Earthquake Engineering",Pearson Pubilications
- Dynamics of structures by Clough & Penziem
- Structural dynamics by Mario Paz
- I.S:1893(latest)" code of practice for earthquakes resistant design of stuctures"
- Anderson R.A fundamentals of vibration, Amerind Pulblishing Co.,1972.

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(AN AUTONOMOUS INSTITUTION)

M.Tech (CE) II Semester

FINITE ELEMENT ANALYSIS OF STRUCTURES

UNTI-I

Introduction-Concepts of FEM –steps involved –merits &demerits –energy principles – Discretization –Rayleigh –Ritz method of functional approximation.**Elastic formulations:** 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 for ID elements –static condensation of global stiffness matrix-solution –Initial strain and temperature effects.

UNIT-III

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 –static condensation.

UNIT-IV

Isoperimetric formulation-Concept, Different isoperimetric elements for 2d analysis-Formulation of 4-noded and 8-noded isoperimetric quadrilateral elements –Lagrangian elements-serendipity elements.**Axi symmetric analysis** –bodies of revolution-axi symmetric modelling –strain displacement relationship-formulation of axi symmetric elements.

UNIT-V

Three Dimensional FEM-Different 3-D elements, 3D strain –displacement relationship-formulation of hexahedral and isoperimetric solid element.

REFERENCE BOOKS:

1. Finite Elements Methods in Engineering by Tirupati. R. Chandrnpatla and Ashok D. Belegundu – Pearson Education Publications.
2. Finite Element analysis – Theory & Programming by C.S.Krishna Murthy- Tata Mc.Graw Hill Publishers Finite Elements Methods in Engineering by Tirupati. R. Chandrnpatla, Universities Press India Ltd. Hyderabad.
3. Finite element method and its application by Desai ,2012, Pearson Pubilications.
4. Finite element methods by Darrel W.Pepper, Vikas Pubilishers
5. Finite element analysis and procedures in engineering by H.V.Lakshminaryana, 3rd edition, universities press, Hyderabad.
6. Finite element analysis in Engineering Design by S.Rajasekharan, S.Chand Publications, New Delhi.
7. Finite element analysis by S.S. Bhavakatti-New age international publishers

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M.Tech (CE) II Semester

STABILITY OF STRUCTURES

UNIT-I

Formulations related to beam columns: Concept of Stability, **Differential** equation for beam columns –Beam column with concentrated loads –continuous lateral load –couples -beam column with built in ends –continuous beams with axial load –application of Trigonometric series –Determination of allowable stresses.

UNIT-II

Elastic Buckling of Bars: Elastic buckling of straight columns –Effect of shear stress on buckling-Eccentrically and laterally loaded columns –energy methods –Buckling of a bar on elastic foundation, Buckling of a bar with intermediate compressive forces and distributed axial loads –Buckling of bars with change in cross section –Effect of shear force on critical load –Built up columns

UNIT-III

Inelastic Buckling and Torsional Buckling : Buckling of straight bars-Double modulus theory – Tangent modulus theory. Pure torsion of thin walled bar of open cross section-Non –Uniform torsion of thin walled bars of open cross section-Torsional buckling –Buckling under Torsion and Flexure.

UNIT-IV

Mathematical Treatment of Stability Problems: Buckling problem orthogonality realation – Ritz method-Timoshenko method, Galerkin method

UNIT-V

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

REFERNCE BOOKS:

1. Stability of metalic structure by Bleich –Mc Graw hill
2. Theory of Beam columns Vol I by chen & Atsuta Mc.Graw Hill
3. Smitses,Elastic stability of structures, Prentice Hall,1973.
4. Timoshenko, S., and Gere., theory of Elastic stability, Mc Graw Hill Book company, 1973.
5. Brush and Almorth., Buckling of bars plates and shells, Mc Graw Hill book company ,1975.
6. Chajes, A., Principles of Structural Stability Theory, Prentice Hall,1974
7. Ashwini Kumar, stability theory of structures, TATA Mc Graw Hill publishing company Ltd, New Delhi,1985.

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(AN AUTONOMOUS INSTITUTION)

M.Tech (CE) II Semester

ANALYSIS OF SHELLS AND FOLDED PLATES

UNIT-I

Equations of equilibrium: Introduction, classification, derivation of stress Resultants, Principles of membrane theory and bending theory.

UNIT-I I

Cylindrical shells: Derivation of governing DKJ equation for bending theory, details of Schorer's theory, Applications to the analysis and design of short shells and long shells. Introduction of ASCE manual co-efficients for design.

UNIT-I II

Introduction to shells of double curvature: (other than shells of revolution:) Geometry and analysis of elliptic paraboloid, rotational paraboloid and hyperbolic paraboloid shapes by membrane theory.

UNIT-I V

Folded Plates: Folded plate theory, plate and slab action, Whitney's theory, Simpson's theory for the analysis of different types of folded plates (Design is not included)

UNIT-V

Shells of double Curvature-Surfaces of revolution .Derivation of equilibrium equations by membrane theory, Applications to spherical shell and rotational Hyperboloid

TEXT / REFERENCE BOOKS:

1. Design and construction of concrete shell roofs by G.S. Rama Swamy – CBS Publishers & Distributors, 485, Jain Bhawan Bhola Nath Nagar, shahotra, Delhi.
2. Fundamentals of the analysis and design of shell structures by Vasant S.kelkar Robert T.Swell – Prentice hall, Inc., Englewood cliffs, new Jersy -02632.
3. N.k.Bairagi, Shell analysis, Khanna Publishers, Delhi, 1990.
4. Billington, Ithin shell concrete structures, Mc Graw Hill Book company, New york, St. Louis, Sand Francisco, Toronto, London.
5. ASCE Manual of Engineering practice No.31, design of cylindrical concrete shell roofs ASC, Newyork.

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES, RAJAMPET

(AN AUTONOMOUS INSTITUTION)

M.Tech (CE) II Semester

DESIGN OF BRIDGES
ELECTIVE-III

UNIT-I

Introduction – Classification, investigations and planning, choice of type – economic span length – IRC specifications for road bridges, standard live loads, other forces acting on bridges, general design considerations.

UNIT-II

Design of box culverts – General aspects – Design loads – Design moments, shears and thrusts – Design of critical section. Design of slab bridges – Effective width of analysis – workings stress design and detailing of slab bridges for IRC loading.

UNIT-III

T-Beam bridges – Introduction – wheel load analysis – B.M. in slab – Pigaud's theory – analysis of longitudinal girders by Courbon's theory working stress design and detailing of reinforced concrete T-beam bridges for IRC loading.

UNIT-IV

Prestressed Concrete Bridges – General features – Advantages of Prestressed concrete bridges – pretensioned Prestressed concrete bridges – post tensioned Prestressed concrete Bridge decks. Design of post tensioned Prestressed concrete slab bridge deck.Bridge Bearings – General features – Types of bearings – forces on bearings basis for selection of bearings – Design principles of steel rocker and roller bearings and its design – Design of elastometric pad bearing detailing of elastometric pot bearings.

UNIT-V

Piers and abutments – General features – Bed block – Materials for piers and abutments – typies of piers – forces acting on piers – Design of pier – stability analysis of piers – general features of abutments – forces acting on abutments – stability analysis of abutments.Bridge foundations – General Aspects – Types of foundations – Pile foundations – well foundations – caisson foundations.

TEXT/REFERENCES :

1. Essentials of bridges engineering – D.Hohnson Victor oxford & IBH publishers co-Private Ltd.
2. Design of concrete bridges MC aswanin VN Vazrani, MM Ratwani, Khanna publishers.
3. Bridge Engineering – S.Ponnuswamy.
4. BRowe, R.E., Concrete Bridge Design, C.R.Books Ltd., London, 1962.
5. Taylor F.W., Thomson, S.E., and Smulski E., Reinforced concrete Bridges, John wiley and sons, New york, 1955.
6. Derrick Beckett, an Introduction to Structural Design of concrete bridges, surrey University; press, Henlely – thomes, oxford shire, 1973
7. Bakht.B.and Jaegar, L.G. bridge Analysis simplified, Mc Graw Hill, 1985.
8. Design of Bridges – N.Krishna Raju – Oxford & IBH
9. Design of Bridge structures – FR Jagadeesh, M.A. jaya Ram – Eastern Economy edition.

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M.Tech (CE) II Semester

ADVANCED CONCRETE TECHNOLOGY
ELECTIVE-III

UNIT-I

Cements and Admixtures: Portland cement – Chemical composition - Hydration, setting and finenesses of cement – structures of hydrated cement – mechanical strength of cement gel - water held in hydrate cement paste – Heat of hydration of cement – Influence of compound composition on properties of cement – tests on physical properties of cement – I.S. specifications – Different types of cements – Admixtures.

UNIT-II

Aggregates: Classification of aggregate – particle shape and texture – Bond strength and other mechanical properties of aggregate specific gravity, Bulk density, porosity, absorption and moisture in aggregate – soundness of aggregate – Alkali – aggregate reaction, Thermal properties – sieve analysis – Fineness modulus – grading curves – grading requirements – practical grading – Road note No.4 grading of fine and coarse aggregates gap graded aggregate – maximum aggregate size.

UNIT-III

Fresh concrete: Workability – factors affecting workability – measurement of workability by different tests – Effect of time and temperature on workability – segregation and bleeding – mixing and vibration of concrete – quality of mixing water.

UNIT-IV

Hardened Concrete: Water/cement ratio-Abram's law – Gel space ratio – effective water in mix – Nature of strength of concrete – strength in tension and compression- Griffith's hypothesis – factors affecting strength – autogeneous healing –Relation between compression and tensile strength – curing and maturity of concrete Influence of temperature on strength – Steam curing – testing of Hardened concrete – compression tests – tension tests – factors affecting strength – flexure tests – splitting tests – Non destructive testing methods.

Elasticity, Shrinkage and Creep: Modulus of elasticity – dynamic modulus of elasticity – poisson's ratio – Early volume changes – swelling – Draying shrinkage - Mechanism of shrinkage – factors affecting shrinkage – Differential shrinkage – moisture movement carbonation shrinkage-creep of concrete – factors influencing creep – relation between creep and time – Nature of creep – Effect of creep.

UNIT-V

Mix Design: Proportioning of concrete mixes by various methods – fineness modulus, trial and error, mix density, Road Note. No. 4, ACI and ISI code methods – factors in the choice of mix proportions – Durability of concrete – quality control of concrete – Statistical methods – High strength concrete mix design. **Special concrete's**: Light weight concretes –light weight aggregate concrete- Mix design – Cellular concrete - No fines concrete – High density concrete – Fiber reinforced concrete – Different types of fibers - factories affecting properties of FRC – Applications polymer concrete – types of polymer concrete properties of polymer concrete applications

TEXT/ REFERENCE BOOKS:

1. Properties of Concrete by A.M.Neville – Pearson publication – 4th edition
2. Concrete Technology by M.S.Shetty. – S.Chand & Co. ; 2004
3. Design of Concrete Mix by Krishna Raju, CBS pubilishers.
4. Concrete: Micro structure, Properties and Materials – P.K.Mehta and J.M.Monteiro, Mc-Graw Hill Publishers
5. Concrete Technology by A.R. Santha Kumar, Oxford university Press, New Delhi
6. Concrete Technology by A.M.Neville – Pearson publication
7. Concrete Technology by M.L. Gambhir. – Tata Mc. Graw Hill Publishers, New Delhi
8. Non-Destructive Test and Evaluation of materials by J.Prasad & C.G.K. Nair , Tata Mcgraw hill Publishers, New Delhi

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M.Tech (CE) II Semester

EARTHQUAKE RESISTANT STRUCTURES

ELECTIVE – III

UNIT-I

Engineering seismology :

Earthquake – causes of earthquake – earthquakes and seismic waves – scale and intensity of earthquakes – seismic activity – Measurements of earth quakes – seismometer- strong motion accelerograph / field observation of ground motion – analysis of earthquakes waves – earth quake motion – amplification of characteristics of surface layers – earthquake motion on the ground surface;

UNIT-II

Vibration of structures under ground motion:

Elastic vibration of simple structures – modelling of structures and equations of motion – freevibrations of simple structures – steady state forced vibrations – Non steady state forced vibrations – response spectrum representations; Relation between the nature of the ground motion and structural damage.

UNIT-III

Design approaches: Methods of analysis – selection of analysis – equivalent lateral force procedure seismic base shear – seismic design co-efficient - vertical distribution of seismic forces and horizontal shear – twisting moment - Over turning moment – vertical seismic load and orthogonal effects lateral deflection – P- Δ characteristics effect – soil structure Interaction. Seismic – Graphs study, earthquake records for design – factors affecting Accelerogram characteristics - artificial Accelerogram – zoning map.Dynamic – analysis procedure: Model analysis – Inelastic – time history analysis Evaluation of the results.

UNIT-IV

Earthquake – Resistant design of structural Components and systems:

Introduction – monolithic reinforced – concrete structures – precast concrete structures – Prestressed concrete structures – steel structures – composite – structures, masonry structures – Timber structures.

UNIT-V

Fundamentals of seismic planning: Selection of materials and types of construction form of superstructure – framing systems and seismic units – devices for reducing. Earthquake loads,

TEXT / REFERENCE BOOKS:

1. Design of earthquake resistant structures by Minoru Wakabayashi.
2. A.K.Chopra, Strucutural Dynamics for Earthquake Engineering", Pearson Pubilications.
3. R.W.Clough and 'Dynamics of structures'. Mc Graw – Hill, 2nd edition, 1992.
4. N.M Newmark and E.Rosenblueth, Fundamentals of Earthquake Engineering' prentice hall,1971.
5. David Key, Earthquake design practice for buildings." Thomas telford,London,1988
6. R.L. Wegel, Earthquake Engg; Prentice Hall 12nd edition 1989.
7. J.A. Blume, N.M. Newmark, L.H. Corning., Design of Multi –storied Buildings for Earthquake ground motions', Portland Cement Association, Chicago,1961
8. I.S.Codes No. 1893,4326,13920.
9. Earthquake Resistant Design by Pankaj Agarwal.

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M.Tech (CE) II Semester

ADVANCED STEEL DESIGN
ELECTIVE-IV

UNIT-I

Design of self supporting stacks/chimneys – Considerations for preliminary design (industrial requirements – thermal requirement – mechanical force requirement – wind load and dead load estimation) – Detailed estimation of wind; dead-and other accidental – loads; Analysis; Detailed design including provision of stakes /spoilers – Design of super structure only.

UNIT-II

Analysis of multi-storey frames using approximate methods and substitute frame method:

a) Cantilever method &
b) Portal method

UNIT-III

Design of Gantry Girder – Introduction – Loads acting on the ganny girder – permissible stresses - types of gantry girders and crane sails – crane data – maximum moments and shears – design procedure (restricted to electrically operated cranes)

UNIT-IV

Theorems of plastic analysis, applications to the cases of rectangular portal frames. Principles of optimization in structural design – Application to simple – rectangular portal frame – minimum weight design.

UNIT-V

General methods of plastic design: combining mechanics methods, plastic moment redistribution method; Application to few cases of simple two storied rectangular portal frames including estimation of deflection.

Books for reference:

1. Plastic analysis of structures by B.G.Neal
2. Steel Skeleton V.I and II by Baker
3. Design of steel structures by Vazarani and Ratwani
4. Strength of materials (Vol-II)) by Timoshenko.
5. Analysis of Steel Structure by Manohar.
6. Analysis of Steel Structure by Pinfold
7. Analysis of Steel Structure by Arya & Azmani
8. Analysis of Steel Structure by Relevant IS codes.
9. Analysis of Steel Structure by Punmia, B.C.

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M.Tech (CE) II Semester

BUILDING CONSTRUCTION MANAGEMENT

ELECTIVE-IV

UNIT-I

Introduction – Types constructions public and private contract management – scrutinizing tenders and acceptance of tenders, contracted, changes and terminating of contract – subcontracts construction organizations – organizational chart-Decentralization payrolls and records – organization chart of a construction company.

UNIT-II

Construction practices – Times Management – bar chart, CPM, PERT – Progress report

UNIT-III

Resources management and inventor- Basic concepts equipment management, material management inventory control.

UNIT-IV

Accounts management – Basic concepts, Accounting system and book keeping, depreciation, Balance sheet, profit and loss account, internal auditing. Quality control by statistical methods, sampling plan and control charts, safety requirements.

UNIT-V

Cost and Financial Management – Cost volume relationship, cost control system, budget concept of valuation, cost of equity capital management cash. Labor and industrial; laws – payment of wages act. Contract labor, workmen's compensation, insurance, industrial disputes act.

REFERENCE:

1. Construction project management by Jha ,Pearson pubilications,New Delhi.
2. Construction Technology by Subir K.Sarkar and Subhajit Saraswati – Oxford Higher Education- Univ.Press, Delhi.
3. Project Planning and Control with PERT and CPM by Dr.B.C.Punmia, K.K.Khandelwal, Lakshmi Publications New Delhi.
4. Optimal design of water distribution networks P.R.Bhave, Narosa Publishing house 2003.
5. Total Project management, the Indian context- by : P.K.JOY- Mac Millan Publishers India Limited.

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M.Tech (CE) II Semester

FRACTURE MECHANICS
ELECTIVE-IV

UNIT-I

Summary of basic problems and concepts:

Introduction - A crack in a structure - The stress at a crack tip - The Griffith criterion The crack opening displacement criterion - Crack Propagation - Closure

UNIT-II

The elastic crack – tip stress field :

The Airy stress function - Complex stress functions - Solution to crack problems - The effect of finite size - Special cases - Elliptical cracks - Some useful expressions

UNIT-III

The crack tip plastic zone:

The Irwin plastic zone correction - The Dugdale approach - The shape of the plastic zone - Plane stress versus plane strain - Plastic constraint factor - The thickness effect

UNIT-IV

The energy principle:

The energy release rate - The criterion for crack growth - The crack resistance (R curve) - Compliance , The J integral (Definitions only)

Plane strain fracture toughness:

The standard test - Size requirements - Non-Linearity – Applicability

Plane stress and transitional behaviour:

Introduction - An engineering concept of plane stress - The R curve concept

UNIT-V

The crack opening displacement criterion:

Fracture beyond general yield - The crack tip opening displacement - The possible use of the CTOD criterion

Determination of stress intensity factors:

Introduction - Analytical and numerical methods - Finite element methods, Experimental methods (An Ariel views only)

REFERENCES;

- Elementary engineering fracture mechanics -David Broek, Battelle, columbus laboratories, columbus, Ohieo, USA
- Fracture and Fatigue Control in Structures - john M.Barsom, Senior
- consultant United states Steel corporation & Stanley T.Rolfe, Ross H.Forney Professor of Engineering University of Kansas. &Stanley T.Rolfe, Ross H.forney

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES, RAJAMPET

(AN AUTONOMOUS INSTITUTION)

M.Tech (CE) II Semester

CONCRETE LABORATORY-II

1. Accelerated curing test on Concrete cubes.
2. Non destructive test on concrete.
3. Study of effect of dosage of super plasticizer on Strength and workability of concrete.
4. Mix design of high strength concrete including casting and testing of specimens.
5. Mix design of fly ash concrete including casting and testing of specimens.
6. Determination of coefficient of permeability of concrete.
7. Determination of drying shrinkage of concrete.
8. Bending test on a RCC beam under.
   a) single point load
   b) Three point load