ACADEMIC REGULATIONS
COURSE STRUCTURE AND SYLLABI

M.TECH.
STRUCTURAL ENGINEERING
(Department of Civil Engineering)

2013 – 2014

COLLEGE OF ENGINEERING
(AUTONOMUS)

GAYATRI VIDYA PARISHAD
COLLEGE OF ENGINEERING
(AUTONOMOUS)

Accredited by NAAC with A Grade with a CGPA of 3.47/4.00

Affiliated to JNTUK-Kakinada

MADHURAWADA, VISAKHAPATNAM – 530 048

VISION

To evolve into and sustain as a Centre of Excellence in Technological Education and Research with a holistic approach.

MISSION

To produce high quality engineering graduates with the requisite theoretical and practical knowledge and social awareness to be able to contribute effectively to the progress of the society through their chosen field of endeavor.

To undertake Research & Development, and extension activities in the fields of Science and Engineering in areas of relevance for immediate application as well as for strengthening or establishing fundamental knowledge.

F O R E W O R D

Two batches of students have successfully completed the M.Tech. programme under autonomous status, which gave us a lot of satisfaction and encouragement. In the light of changing scenario of accreditation process globally, to upkeep the quality of education further, a major revision in the curriculum has been taken up with an objective to provide outcome based education.

As the college is getting funds under TEQIP-II, S.C.1.2 for up-scaling P.G education and research, two more P.G programmes in the thrust areas are being introduced from this academic year leading to a total of 13 programmes.

We could execute these changes through the contributions of our dedicated faculty, the commendable academicians from Institutions of repute, the enthusiastic representatives from Industry, affiliating University JNTU-K and UGC present in the Boards of Studies, Academic Council and Governing Body.

It is hoped that the new regulations and curriculum will enhance the all-round ability of students so that they can technically compete at global level with native ethical standards.

PRINCIPAL

MEMBERS ON THE BOARD OF STUDIES
IN
CIVIL ENGINEERING

Dr. K. Raja Gopal,
Professor in Civil Engineering, IIT Madras, Chennai – 600 036.

Sri K. Ravi Kumar,
Project Director, Sheladia Inc., Near TTD Kalyana Mandapam, M.V.P. Colony, Visakhapatnam – 530 017.

Dr. B. Sivarama Sarma,
Head (R&D), Research & Testing Centre, L & T Construction, B.O.Box No.979, Chennai – 600 089.

Dr. D.S.R. Murthy,
Professor, Department of Civil Engg., College of Engineering, Andhra University, Visakhapatnam – 530 003.

Dr. P. Uday Bhaskar, Principal, JNTU College of Engineering, Vizianagaram.

Prof. D. Nagesh Kumar,
Professor, Water Resources & Environmental Engineering Department of Civil Engg., Indian Institute of Science,
Bangalore – 560 012.

Ms. Hasini Alahari,
Flat # 401, Rajasam Apartments, TV Tower Road, ASR Nagar, Bhimavaram.

M.TECH. ACADEMIC REGULATIONS

(Effective for the students admitted into first year from the Academic Year 2013 - 14)

The M.Tech. Degree of Jawaharlal Nehru Technological University Kakinada shall be recommended to be conferred on candidates who are admitted to the program and fulfill all the following requirements for the award of the Degree.

1.0 ELGIBILITY FOR ADMISSION:

Admission to the above program shall be made subject to the eligibility, qualifications and specialization as per the guidelines prescribed by the APSCHE and AICTE from time to time.

2.0 AWARD OF M.TECH. DEGREE:

a. 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.

b. 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.

c. The duration of each semester shall normally be 20 weeks with 5 days a week. A working day shall have 7 periods each of 50 minutes.

3.0 STRUCTURE OF THE PROGRAMME:

Semester	No. of Courses per Semester	Credits
	Theory + Lab	
I	(5 +1*) + 1	20
II	(5+1*) + 1	20
III	Seminar	02
III, IV	Project Work	40
	TOTAL	**82**

*Elective

4.0 ATTENDANCE:

The attendance shall be considered subject wise.

a. A candidate shall be deemed to have eligibility to write his end semester examinations in a subject if he has put in at least 75% of attendance in that subject.
b. Shortage of attendance up to 10% in any subject (i.e. 65% and above and below 75%) may be condoned by a Committee on genuine and valid reasons on representation by the candidate with supporting evidence.
c. Shortage of attendance below 65% shall in no case be condoned.
d. A student who gets less than 65% attendance in a maximum of two subjects in any semester shall not be permitted to take the end- semester examination in which he/she falls short. His/her registration for those subjects will be treated as cancelled. The student shall re-register and repeat those subjects as and when they are offered next.
e. If a student gets less than 65% attendance in more than two subjects in any semester he/she shall be detained and has to repeat the entire semester.

5.0 EVALUATION:

The performance of the candidate in each semester shall be evaluated subject-wise with 100 marks for each theory subject and 100 marks for each practical, on the basis of Internal Evaluation and External End -Semester Examination. The question paper of the external end semester examination shall be set externally and valued both internally and externally. If the difference between the first and second valuations is less than or equal to 9 marks, the better of the two valuations shall be awarded. If the difference is more than 9 marks, the scripts are referred to third valuation and the corresponding marks are awarded.

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

b. For the theory subjects, 60 marks shall be awarded based on the performance in the End Semester examination and 40 marks shall be awarded based on the Internal Evaluation. One part of the internal evaluation shall be made based on the average of the marks secured in the two internal examinations of 30 marks each conducted one in the middle of the Semester and the other immediately after the completion of instruction. Each mid-term examination shall be conducted for a duration of 120 minutes with 4 questions without any choice. The remaining 10 marks are awarded through an average of continuous evaluation of assignments / seminars / any other method, as notified by the teacher at the beginning of the semester.

c. For practical subjects, 50 marks shall be awarded based on the performance in the End Semester Examinations, 50 marks shall be awarded based on the day-to-day performance as Internal marks**.** A candidate has to secure a minimum of 50% in the external examination and has to secure a minimum of 50% on the aggregate to be declared successful.

d. There shall be a seminar presentation during III semester. For seminar, a student under the supervision of a faculty member(advisor), 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 shall consist of the Head of the Department, advisor and two other senior faculty members of the department. For Seminar, there will be only internal evaluation of 50 marks. A candidate has to secure a minimum of 50% to be declared successful.

e. In case the candidate does not secure the minimum academic requirement in any subject (as specified in 5.a to 5.c), 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 in that subject is less than 50% and he has failed in the end examination. In such a case, the candidate must re-register for the subject (s). In the event of re-registration, the internal marks and end examination marks obtained in the previous attempt are nullified.

f. 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 those subject(s). He shall re-register for the subject(s) when they are next offered.

g. Laboratory examination for M.Tech. subjects must be conducted with two Examiners, one of them being Laboratory Class Teacher and second examiner shall be other than the Laboratory Teacher.

6.0 EVALUATION OF PROJECT / DISSERTATION WORK:

Every candidate shall be required to submit the thesis or dissertation after taking up a topic approved by the Departmental Research Committee (DRC).

a. A Departmental Research Committee (DRC) shall be constituted with the Head of the Department as the Chairman and two senior faculty as Members to oversee the proceedings of the project work from allotment of project topic to submission of the thesis.

b. A Central Research Committee (CRC) shall be constituted with a Senior Professor as Chair Person, Heads of the Departments which are offering the M.Tech. programs and two other senior faculty members from the same department.

c. 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.)

d. After satisfying 6.0 c, a candidate has to submit, in consultation with his project supervisor, the title, objective and plan of action of his project work to the DRC for its approval. Only after obtaining the approval of DRC the student can initiate the Project work.

e. If a candidate wishes to change his supervisor or topic of the project he can do so with the approval of the DRC. However, the Departmental Research Committee shall examine whether the change of topic/supervisor leads to a major change in his initial plans of project proposal. If so, his date of registration for the Project work shall start from the date of change of Supervisor or topic as the case may be whichever is earlier.

f. A candidate shall submit and present the status report in two stages at least with a gap of 3 months between them after satisfying 6.0 d. The DRC has to approve the status report, for the candidate to proceed with the next stage of work.

g. 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 shall be permitted to submit his dissertation only after successful completion of all theory and practical subject with the approval of CRC but not earlier than 40 weeks from the date of registration of the project work. For the approval by CRC the candidate shall submit the draft copy of the thesis to the Principal through the concerned Head of the Department and shall make an oral presentation before the CRC.

h. Three copies of the dissertation certified by the Supervisor shall be submitted to the College after approval by the CRC.

i. For the purpose of adjudication of the dissertation, an external examiner shall be selected by the Principal from a panel of 5 examiners who are experienced in that field proposed by the Head of the Department in consultation with the supervisor.

j. The viva-voce examination shall be conducted by a board consisting of the supervisor, Head of the Department and the external examiner. The board shall jointly report the candidate's work as:

A. Excellent
B. Good
C. Satisfactory

k. If the adjudication report is not favorable, the candidate shall revise and resubmit the dissertation, in a time frame prescribed by the CRC. If the adjudication report is unfavorable again, the dissertation shall be summarily rejected and the candidate shall change the topic of the Project and go through the entire process afresh.

7.0 AWARD OF DEGREE AND CLASS :

A candidate shall be eligible for the degree if he satisfies the minimum academic requirements in every subject and secures satisfactory or higher grade report on his dissertation and viva-voce.

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 three classes.

% of Marks secured	Class Awarded
70% and above	First Class with Distinction
60% and above but less than 70%	First Class
50% and above but less than 60%	Second Class

The grade of the dissertation shall be mentioned in the marks memorandum.

8.0 WITHHOLDING OF RESULTS:

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

9.0 TRANSITORY REGULATIONS:

a. A candidate who has discontinued or has been detained for want of attendance or who has failed after having studied the subject is eligible for admission to the same or equivalent subject(s) as and when subject(s) is/are offered, subject to 4.0 d, e and 2.0.
b. Credit equivalences shall be drawn for the students re-admitted into 2013 regulations from the earlier regulations. A Student has to register for the substitute / compulsory / pre-requisite subjects identified by the respective Boards of Studies.
c. The student has to register for substitute subjects, attend the classes and qualify in examination and earn the credits.
d. The student has to register for compulsory subjects, attend the classes and qualify in examination.
e. The student has to register for the pre-requisite courses, attend the classes for which the evaluation is totally internal.

10.0 GENERAL

1. The academic regulations should be read as a whole for purpose of any interpretation.

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

3. The College may change or amend the academic regulations and syllabus at any time and the changes amendments made shall be applicable to all the students with effect from the date notified by the College.

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

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COURSE STRUCTURE

SEMESTER - I

Course Code	Theory / Lab	L	P	C
13CE2201	Advanced Design of Concrete Structures	4	-	3
13CE2202	Structural Optimization	4	-	3
13CE2203	Structural Dynamics	4	-	3
13CE2204	Advanced Methods of Structural Analysis	4	-	3
13CE2205	Theory of Elasticity and Plasticity	4	-	3
	Elective – I	4	-	3
13CE2206	Pre-stressed Concrete Technology			
13CE2108	Power Plant Design			
13CE2207	Stability of Structures			
13CE2104	Industrial Structures			
13CE2208	Experimental Techniques in Structural Engineering Lab	-	3	2
	Total	**24**	**3**	**20**

SEMESTER – II

Course Code	Theory / Lab	L	P	C
13CE2209	Advanced Steel Structural Design	4	-	3
13CE2210	Earthquake Resistant Design of Structures	4	-	3
13CE2211	Advanced Foundation Engineering	4	-	3
13CE2212	Finite Element Method with Structural Applications	4	-	3
13CE2213	Theory and Design of Plates and shells	4	-	3
	Elective- II	4	-	3
13CE2214	Bridge Engineering			
13CE2115	Port & Harbour Structures			
13CE2215	Advanced Concrete Technology			
13CE2216	Disaster Management			
13CE2217	Computer Applications in Structural Engineering Lab	-	3	2
	Total	**24**	**3**	**20**

SEMESTER – III

Course Code	SEMINAR/ PROJECT WORK	CREDITS
13CE2218	SEMINAR	2
13CE2219	PROJECT WORK (Contd..)	-

SEMESTER – IV

Course Code	PROJECT WORK	CREDITS
13CE2219	PROJECT WORK	40

ADVANCED DESIGN OF CONCRETE STRUCTURES

Course Code: 13CE 2201 **L P C**
4 0 3

Course Educational Objectives:

1. To impart knowledge about the RC design of flat slabs, grid floors, and chimneys.
2. To familiarize the student with knowledge of Bunkers, Silos and Void slabs.

Course Outcomes:

1. Students will demonstrate the ability to design reinforced concrete flat slabs, grid floors, and chimneys.
2. Students will demonstrate the ability to design reinforced concrete Bunkers, Silos and Void slabs.
3. To impart the students, with the knowledge of estimation of crack width and deflection of beams.
4. To impart the students, with the knowledge of Analysis and Design of Grid Floors.

UNIT – I

DEFLECTION AND CRACK WIDTH ESTIMATION:

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, Deflection of slabs by IS 456.

Estimation of Crack width in Reinforced Concrete Members: Introduction, Factors affecting crack width in beams, Mechanisms of flexural cracking, Calculation of crack width, Simple empirical method, Estimation of crack width in beams by IS 456, Shrinkage and thermal cracking.

UNIT – II

Analysis and Design of Grid Floors: Introduction, Analysis of flat grid floors, Analysis of rectangular grid floors by Timoshenko's plate theory. Analysis of grid by stiffness matrix method, Analysis of grid floors by equating joint deflections, Comparison of methods of Analysis, Detailing of steel in flat grids.

UNIT – III

Analysis and Design of flat slabs: Introduction, Proportioning of flat slabs, Determination of bending moment and shear force, the direct design method, Equivalent frame method, slab reinforcement details.

UNIT – IV

FIRE AND SEISMIC RESISTANCE OF CONCRETE STRUCTURES:

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, Analytical determination of the ultimate bending moment, Capacity of reinforced concrete beams under fire, Other considerations.

Ductile Detailing of Frames for Seismic Forces: Introduction, General principles, Factors that increase ductility, Specifications of materials for ductility, ductile detailing of beams – Requirements, Ductile detailing of columns and frame members with axial load (P) and moment (M) – Requirements. Shear walls, Joints in frames.

UNIT – V

Bunkers and Silos: Introduction, Design of rectangular bunkers, circular bunkers and silos

Chimneys: Introduction, Design factors, Stresses due to self weight, wind and temperature, Combinations of stresses.

TEXT BOOKS

1. Bhavikatti S. S. *"Advance RCC Design"*, 3rd Edition, New Age International Private Limited, 2008
2. Krishnam Raju, N. *"Design of Reinforced Concrete Structures",* 2nd Edition, CBS Publishers and Distributors, New Delhi, 2007.

REFERENCES

1. Varghese P.C. *"Advanced Reinforced Concrete Design",* 2nd Edition, Prentice - Hall of India, , 2008
2. Indian Standarad Code 456 2000, *"Code of Practice for plan & reinforced centre"*, British Standard Code-2000.
3. Special Publications -16, *"Design Aids for Reinforced Concrete*", to Is: 456.
4. Purushothaman,P., *"Reinforced Concrete Structural Elements"*, 3rd Edition, Tata Mc Graw- Hill Publishing Co, 2004.
5. Pillai and Devadas Menon, *"Reinforced Concrete Design",* 2nd Edition, Tata McGraw Hill Publishing Co. Ltd., 2003.

STRUCTURAL OPTIMIZATION

Course Code: 13CE 2202

L	P	C
4	0	3

Course Educational Objectives:

1. To impart the knowledge of problem formulation in structural optimization
2. To familiarize the student about various methods of optimization

Course Outcomes:

1. Student should be able to form a problem formulation for a given structure
2. Student should be able to get optimized structure using classical and modern methods of optimization.
3. To impart the students, with the knowledge of Formulation of Structural Optimization problems.
4. Formulation of Structural Optimization problems: Design variables - Objective function – Constraints.
5. Classical methods of optimization for multivariable with equality or inequality constraints: solution by method of Lagrange Multiplier - Applications in structural engineering, Kuhn-Tucker conditions.

UNIT – I

Formulation of Structural Optimization problems: Design variables - Objective function – constraints.

Classical methods of optimization for multivariable with equality or inequality constraints: solution by method of Lagrange Multiplier - Applications in structural engineering, Kuhn-Tucker conditions.

UNIT – II

Nonlinear Programming: Unconstrained and Constrained Optimization - Direct search and gradient methods- Basic approach of the Penalty function method - Interior penalty function method and Exterior penalty function method – design of three bar truss, space truss, welded beam design

UNIT – III

Genetic Algorithms: – Introduction – basic concept – working principle - Binary coding- Fitness function - Genetic Operators - Application to Two bar pendulum, 3-bar truss, optimum fibre orientation, Genetic Algorithms applications to discrete size

UNIT – IV

Simulated annealing: problem formulation- steps involved in SA- application to RCC retaining wall, and pre-stressed concrete structure design.

UNIT – V

Artificial Neural Networks based approaches for structural optimization problems- Introduction- basic concept of ANN- Architectures and learning methods of NN- Back propagation networks- structural application

TEXT BOOKS

1. Rao, S.S. *"Engineering Optimization, Theory and Applications"*, 3rd Edition, New Age International publication, New Delhi, 2010.

2. Rajasekaran, S. and Vijaya Lakshmi Pai, G.A. "*Newral networks, Fuzzy logic, and genetic Algorithms, Synthesis and Application"*, 1st Edition, PHI, 2003

REFERENCES

1. Arora, J.S. *"Introduction to Optimum Design"*, 2nd Edition, McGraw-Hill Book Company, 2000.

2. MorrIs A.J., *"Foundations of Structural Optimization - A Unified Approach"*, 3rd Edition, John Wiley and Sons, 2003.

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STRUCTURAL DYNAMICS

Course Code: 13CE 2203

L	P	C
4	0	3

Course Educational Objectives:

1. To create a understanding on application of single degree and multi-degree freedom systems.
2. To impart the knowledge on calculation of mode superposition

Course Outcomes:

1. Students acquire the ability to analyze multi-degrees of freedom system for structures.
2. The student will demonstrate the ability to analyze the structures for dynamic effects.
3. To impart the students, with the knowledge of Single degree of freedom system
4. Single degree of freedom system: Natural Vibration, time period, amplitude, various forcing functions, Response to undamped & damped system.

UNIT – I

Single degree of freedom system: Natural Vibration, time period, amplitude, various force
functions, Response to undamped & damped system.

UNIT – II

Single degree of freedom system: Forced vibration, Response to damped & undamped, Response to pulsating force, Support motion (Transmissibility).

UNIT – III

Single degree of freedom system: Coloumb damping, Viscous damped for harmonic vibration & frequency response curve.

UNIT – IV

Multi degree freedom system: Determination of natural frequency, characteristic shapes for undamped system, orthogonality of natural modes and normal coordinates.

UNIT – V

Methods of combining modes: Mode superposition method, Modal truncation errors-Modal Acceleration method, Direct Integration methods, Explicit and Implicit methods.

TEXT BOOKS:

1. Chopra A. K., *"Dynamics of Structures"*, 3rd Edition, Pearson edition, 2007.

2. Mario Paz, William Leigh., "*Structural Dynamics: Theory and Computation"*, 5th edition, Springer. 2003.

REFERENCES:

1. Raymond W. Clough, Joseph Penzien , *"Dynamics of Structures",* Mc Graw-Hill Book Company.

2. W. Weaver, Jr., S. P. Timoshenko, D. H. Young. "*Vibration Problems in Engineering"* , 4th Edition. 2010.

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ADVANCED METHODS OF STRUCTURAL ANALYSIS

Course Code: 13CE 2204

L	P	C
4	0	3

Course Educational Objectives:

1. To impart knowledge of analyzing beams and framed structures using matrix methods
2. To develop analytical skills of solving beams and trusses using influence lines.
3. To impart analyzing axial bars and beams using Galarkin's method and Rayleigh Ritz method.

Course Outcomes:

1. The students shall be able to analyze beams and building frames by matrix and approximate methods for gravity loads and wind loads.
2. The student will demonstrate the ability to analyze cable and suspension bridges.
3. To impart the students, with the knowledge of Flexibility Method, Stiffness Method

UNIT-I

Flexibility Method: Analysis of Indeterminate beams, Frames and trusses by flexibility matrix method (upto maximum Static indeterminacy of 3 and support settlements not included).

UNIT-II

Stiffness Method: Analysis of Indeterminate beams, frames and trusses by stiffness matrix method (up to maximum Kinematic indeterminacy of 3 and support settlements not included).

UNIT-III

Influence lines: Analysis of indeterminate beams, two arches, three hinged arches, Pratt type of trusses using influence lines.

UNIT-IV

Cable and Suspension Bridges: Introduction, Equation of the cable, General Cable theorem, horizontal reaction for uniformly loaded cable, Tension in the cable supported at same and different levels, lengths of the cable when supported at the same level. Temperature effect on the cable.

UNIT-V

Rayleigh'S Ritz method: Analysis of axially loaded bars and beams by Rayleigh Ritz method.

Gelarkin's method: Analysis of axially loaded bars and beams by Gelarkin's method.

TEXT BOOKS

1. G.S. Pandit & S.P. Gupta, *"Structural Analysis – A matrix approach"*, 2nd Edition, Tata Mc Grah Hill Companies, 2011.

2. S.B. Junarkar, *"Mechanics of Structures",* 3rd Edition, Dhanpat Rai Publications, 2011.

REFERENCES

1. Devdas Menon, *"Structural Analysis"*, 2nd Edition, Narosa Publications, 2012.

2. V.K. Manicka Selvam, *"Finite Element Premier",* 3rd Edition, Dhanapat Rai Publications, 2011.

3. S. Ramamrutham & R. Narayanan, *"Theory of Structures",* 9th Edition, Dhanapat Rai Publications, 2012.

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THEORY OF ELASTICITY AND PLASTICITY

Course Code: 13CE 2205 **L P C**
4 0 3

Course Educational Objectives**:**

1. To impart knowledge of Principal stresses and strains
2. To develop analytical skills of solving problems using plain stress and plain strain.
3. To impart knowledge of engineering application of plasticity.

Course Outcomes:

1. The students shall be able to demonstrate the application of plane stress and plane strain in a given situation.
2. The student will demonstrate the ability to analyze the structure using plasticity.
3. To impart the knowledge of stress-strain relations for linearly elastic solids, and Torsion.

UNIT-I

Elasticity: Analysis of stress and strain, Definition of stress and strain at a point, Equilibrium and compatibility equations, Transformation of stress and strain at a point

Principal stresses and strains: Stress and strain invariants, hydrostatic and deviator stress strains.

UNIT-II

Plane stress and plane strain: - Simple two dimensional problems in Cartesian and polar co-ordinates, Airy's stress function in rectangular and polar coordinates.

UNIT-III

Stress-strain relations for linearly elastic solids: Generalized Hooke's law. Solution of axi-symmetric problems, stress concentration due to presence of a circular hole, Elementary problems of elasticity in three dimensions.

UNIT-IV

Torsion: St.Venant's approach-Prandtl's approach – Membrane analogy - Torsion of thin walled open and closed sections.

UNIT-V

Plasticity: Physical Assumptions – Yield criteria - Tresca and VonMises criterion of yielding, plastic stress strain relationship, Elastic plastic problems in bending. Some engineering applications of elasticity and plasticity

TEXT BOOKS

1. Timoshenko, S. and Goodier J.N. *"Theory of Elasticity"*, 2nd Edition, McGraw Hill Book Co, 2001.

2. Sadhu Singh, *"Theory of Elasticity"*, 3rd Edition, Khanna Publishers, 2003.

REFERENCES

1. Chen W.F. and Han D.J. *"Plasticity for structural Engineers",* 1st Edition,. Springer-Verlag, 2000.

2. Irving H.Shames and James,M.Pitarresi. *"Introduction to Solid Mechanics"*, 4th Edition, Prentice Hall of India Pvt. Ltd., 2000.

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PRESTRESSED CONCRETE TECHNOLOGY
(Elective – I)

Course Code: 13CE 2206

L	P	C
4	0	3

Course Educational Objectives:

1. To impart the knowledge on pre-stressing techniques and materials required for pre-stressing.
2. To familiarize the student with the losses of pre-stress and design of beams for flexure and shear.

Course Outcomes:

1. The students will be able to analyze and design pre-stressed concrete members including end blocks.
2. To impart the students, with the knowledge of Materials, Prestressing Systems, End Anchorages, Losses of Pre-stress.
3. To impart the students, with the knowledge of Analysis and Design of sections for Flexure.

UNIT-I

Materials, Pre-stressing Systems, End Anchorages, Losses of Pre-stress.

UNIT-II

Analysis and Design of Sections for Flexure.

UNIT-III

Design for Shear, Bond and Bearing.

UNIT-IV

Camber, Deflections, Cable Layouts. Continuous Beams. Load-Balancing Method.

UNIT-V

Slabs: Tension Members, Circular Pre-stressing. Compression Members, and Piles.

TEXT BOOKS

1. Krishnam Raju,N., *"Design of Prestressed Concrete Srtuctures"*, 4th Edition, TMH, 2004
2. Lin., T.Y., *"Design of Prestressed Concrete Structures"*, 2nd Edition, John Wiley & Sons, 1999.

REFERENCES

1. Edward G. Nawy, *"Prestressed Concrete A Fundamental Approach"*, 1st Edition, Prentice Hall, 2002.
2. Rajagopalan. N, *"Prestressed Concrete"*, 2nd Edition, Narosa publications, 2006.

POWER PLANT DESIGN
(Elective – I)

Course Code: 13CE 2108

L	P	C
4	0	3

Course Educational Objectives: :

1. To impart the knowledge on power plants, chimneys and cooling towers
2. To familiarize the student with the design of ware house structures

Course Outcomes:

1. The students will be able to analyze and design of power plants, chimneys, cooling towers and ware house structures.
2. To impart the students, with the knowledge of intake towers.
3. To impart the students, with the knowledge of analysis of warehouse structures.

UNIT – I

Power Plants: Planning and Layout of different types of power plants.

Chimneys: Analysis and Design of Chimneys. IS codal provisions.

UNIT – II

Cooling Towers: Induced draught and natural draught cooling towers.

UNIT – III

Foundation: Machine foundations & Turbo generator foundations.

UNIT – IV

Intake Towers: Dams, wells and Intake galleries

UNIT – V

Storage Structures: Analysis and Design of ware house structures.

TEXT BOOKS:

1. Vijay K. Puri and Shamsher Prakash, *"Foundations for Machines: Analysis and Design (Series in Geotechnical Engineering)",* 2nd Edition, John Wiley & Sons, 2000.

2. Krishna Raju N. *"Advanced Reinforced Concrete Design",* 2nd Edition, CBS Publishers and Distributors, 2006.

REFERENCES:

1. Eldey Mc. K., Naxey Brooke K.K. *"The Industrial Cooling Tower with special reference to design, construction, operation and maintenance of water cooling tower"*, 1st Edition, Elsevier Publishing company, 1990.

2. Smith, Bryan Stafford & Alex C., *"Tall Building Structures & Analysis Design",* 1st Edition, John Wiley, 2011.

3. Srinivasulu, P and Vaidyanathan, G.V., *"Handbook of Machine Foundations"*, 2nd Edition, Tata McGraw Hill, , 1999.

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STABILITY OF STRUCTURES
(Elective – I)

Course Code: 13CE 2207

L	P	C
4	0	3

Course Educational Objectives:

1. To impart the knowledge on linear and nonlinear behavior of structures
2. To familiarize the student with stability of plates under combined loads

Course Outcomes:

1. The students will be able to analyze structures with linear and nonlinear behavior.
2. To impart the students, with the knowledge of Stability of continuous systems.
3. To impart the students, with the knowledge of Combined axial-flexural-torsion buckling.

UNIT – I

Criteria for design of structures:, Classical concept of stability strength, and stiffness;
Stability of discrete systems: linear and nonlinear behavior.

UNIT – II

Stability of continuous systems: stability of columns axial–flexural buckling, lateral bracing of columns.

UNIT – III

Stability of frames: member buckling versus global buckling, slenderness ratio of frame members;

UNIT – IV (10 Lectures)

Stability of beams: lateral-torsion buckling

UNIT – V (12 Lectures)

Stability of plates: axial-flexural buckling, shear flexural buckling, buckling under combined loads.

TEXT BOOKS

1. Timoshenko, S.P. and Gere,J.M., *"Theory of elastic stability"*, 2nd Edition, McGraw Hill, London, 1961

2. Chajes,A., *"Principles of elastic stability"*, 1st Edition, Prentice Hall, NJ, 1998

REFERENCES

1. Simitses,G.J., *"An introduction to the elastic stability of structures"*, 2nd Edition, Prentice Hall, NJ, 2001.

2. Bazant, Z.P. and Cedolin, L., *"Stability of structures"*, 1st Edition, Oxford University Press, Oxford, 2004.

3. Brush, B.O., and Almoroth,B.O.,*" Buckling of Bars, Plates and Shells"*, 3rd Edition, McGraw Hill, NY, 2006.

4. Galambos,T.V., *"Guide to stability design criteria for metal Structures"*, 2nd Edition,Wiley, NY, 2000.

5. Iyengar, N G R, *"Structural stability of columns and plates"*, 1st Edition, Affiliated East- West Press, New Delhi, 2000.

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INDUSTRIAL STRUCTURES

(Elective – I)

Course Code: 13CE 2104

L	P	C
4	0	3

Course Educational Objectives: :

1. To impart the knowledge on planning and functional requirement of industrial structures
2. To familiarize the student with prefabrication and construction techniques of industrial structures

Course Outcomes:

1. The students will demonstrate the ability to learn design and constructional aspects of industrial structures
2. To impart the students, with the knowledge of planning and functional requirements of industrial structures.
3. To impart the students, with the knowledge of Loads on Industrial structures
4. To impart the students, with the knowledge of Tower cranes and Transmission line and Communication towers.

UNIT –I

PLANNING AND FUNCTIONAL REQUIREMENTS: Classification of Industrial structures - Choice of site - General requirements of different types of industries for safety, space requirements, services and landplaning for Layout Requirements regarding Lighting, Ventilation and Fire Safety - Protection against noise and vibration - Guidelines from Factories Act. Codes of practice in the design and construction

MATERIALS: Properties of Concrete, Steel, R.C.C, Prestressed Concrete, Aluminum, PVC that affect the structural performance – relative merits and demerits – suitability as construction material in Industrial Structures.

UNIT- II

LOADS ON INDUSTRIAL BUILDINGS, VARIOUS CONFIGURATIONS - Loads on Industrial structures – Gravity load, Live load, wind load and Earthquake load - Configuration of various Industrial buildings, Need for large column free areas - Various types of Floors, Roofs and Roof coverings.

UNIT-III

STEEL PORTAL FRAMES: Introduction to Plastic Analysis - Shape factor – Plastic moment carrying capacity of simple beams and portal frames – Design of steel portal frames with and without Gantry girders.

UNIT –IV

STEEL TRUSS: Tower Cranes and Transmission line and Communication towers. Analysis and design of bracing systems in industrial sheds.

UNIT- V

PREFABRICATION AND CONSTRUCTION TECHNIQUES: Pre-casting techniques - Planning, Analysis and design considerations suitability for Industrial structures. Handling techniques – Transportation, Storage and erection of structures. Test on precast elements - Quality control - Repairs and economical aspects on prefabrication.

TEXTBOOKS

1. Duggal, S.K., Design of Steel Structures Tata McGraw-Hill Publications, 3rd Edition, 2006.

2. Krishna Raju N. "Advanced Reinforced Concrete Design", CBS Publishers, 2nd Edition, 2006.

REFERENCES

1. *"Teaching Resource for Structural Steel Design"* – INSDAG, Kolkatta, 2008.

3. IS: 456 – 2000, IS: 800 – 2007, IS: 875 – 1964, BIS, New Delhi.

4. *"Large Panel Prefabricated Constructions, Proc. of Advance Course"* by SERC, Madras, 2004.

5. *"National Building Code*", BIS, New Delhi, 2005.

6. Subrahmanyam, N., *"Space Structures",* Wheeler & Co., Allahabad, 1st Edition, 1999.

EXPERIMENTAL TECHNIQUES IN STRUCTURAL ENGINEERING LAB

Course Code: 13CE 2208

L	P	C
0	3	2

Course Educational Objectives:

To impart knowledge on experiments includes flexural, shear capacity of RC beams.

Course Outcomes:

The student should be capable of testing of RC beams for flexural and shear capacity.

1. Elastic properties of concrete.
2. Elastic properties of steel.
3. Shear capacity of R.C. beams.
4. Flexural test on R.C. Beams.
5. Modulus of rupture of concrete
6. Flexural capacities of R.C. slabs.
7. Flexural capacity of corrugated metal decks.
8. Non-Destructive testing of Concrete.
9. Double shear test on steel rod specimen.
10. Pre-stressing of beam (pre-tensioning)
11. Pre-stressing of beam (post-tensioning)
12. Strain measurement using strain gauges.

REFERENCES

1. Relevant IS Codes: 456-2000, IS: 800-2007, IS: 10262-2009.
2. Shetty M.S; *"Concrete Technology"* , 3rd Edition, S chand Publications – 2008.
3. Neville A.M. *"Properties of Concrete",* 4th Edition, S Chand Publications.

ADVANCED STEEL STRUCTURAL DESIGN

Course Code: 13CE 2209 **L P C**
4 0 3

Course Educational Objectives:

1. To impart the knowledge on foot bridge, transmission towers, steel chimneys and through type truss bridge, gantry girder.
2. To familiarize the student with design of steel tanks and pre-engineered building systems.

Course Outcomes:

1. The students will demonstrate the ability to learn design and constructional aspects of steel structures.
2. To impart the students, with the knowledge of analysis and design for transmission line tower.
3. To impart the students, with the knowledge of design of self supporting steel chimneys including foundations.

UNIT-I

Design of pedestrian Bridge (N-Truss and Pratt), Design of through type truss bridge member for dead load and equivalent live load including top, bottom bracings and portal bracing.

UNIT-II

Analysis and design for transmission line tower.

UNIT-III

Design of self supporting steel chimneys including foundations.

UNIT-IV

Design of North light trusses and Lattice girder.

UNIT-V

Design of water storage and oil storage steel tanks.

TEXT BOOKS

1. Ramchandra. *"Design of Steel Structures Vol. I & II",* 3rd Edition, Standard Book House, New Delhi, 1998
2.Duggal, S.K., *"Design of Steel Structures",* 3rd Edition, Tata McGraw-Hill Publications, 2006

REFERENCES

1. Indian Standard Code 800-2007.
2. Bureau of Indian Standard Code, Special Publications 36.
3. MBMA and AISC Hand Books

EARTHQUAKE RESISTANT DESIGN OF STRUCTURES

Course Code: 13CE2210

L	P	C
4	0	3

Course Educational Objectives:

1. To impart the knowledge on causes and effects of earthquakes.
2. To familiarize with Seismic codal and detailing provisions.
3. To create a strong understanding on application of retrofitting techniques of RC buildings.

Course Outcomes:

1. Student acquire the ability to analyze multi-degrees of freedom system for structures.
2. The student will demonstrate the ability to design earthquake-resistant structures.
3. Students acquire knowledge in Seismic codal and detailing provisions.

UNIT – I

Engineering Seismology: Introduction, causes and effects of earth quakes faults, structure of earth, plate tectonics, elastic rebound theory, earth quake terminology- source, focus, epicentre, hypocenter, Earthquake size, magnitude & intensity, Seismic waves, Seismic zones, Seismic zoning map of India, seismo grams and accelerograms.

UNIT – II

Codal Design Provisions: Review of the latest Indian Seismic code IS: 1893 – 2002 (Part- I) provisions for buildings, earthquake design philosophy, assumptions, design by Seismic coefficient and response spectrum methods, displacements and drift requirements. Analysis of multi storeyed building using Seismic coefficient method.

Codal Detailing Provisions: Review of latest Indian Seismic codes IS: 4326 & IS: 13920 provisions for ductile detailing of R.C. buildings, beam, column and joints.

UNIT – III

A Seismic Planning: Plan configurations, Torsion irregularities, re-entrant corners, non-parallel systems, diaphragm discontinuity, vertical discontinuity in load path, irregularities in strength and stiffness, Mass irregularities, Vertical geometric irregularity, Proximity of adjacent buildings.

Shear Walls: Introduction, types of shear walls, description of building, determination of lateral forces in buildings, design of shear walls as per Indian Standard Code : 13920, detailing of reinforcement of shear walls.

UNIT – IV

Retrofitting Techniques: Introduction, consideration in retrofitting of structures, classification of retrofitting techniques, retrofitting strategies of R.C. buildings like structural level and member level.

UNIT – V

Masonry Buildings : Introduction, determination of design lateral load, determination of wall rigidities, determination of Torsional forces, determination of pier loads, moments and shear, design of shear walls for shear, structural details.

TEXT BOOKS

1. Agarwal pankaj & shrikhande Manish *" Earthquake Resistant Design of Structures",* 2nd Edition, Eswar Press, 2010.

2. JaiKrishna and Chandrasekharan, *"Elements of Earthquake Engineering"*, 3rd Edition, Saritha Prakasham, Meerut, 2009.

REFERENCES

1. Anil K. Chopra, *"Dynamics of Structures, Theory and Applications to Earthquake Engineering"*, 3rd Edition, Prentice Hall of India, 2009.

2. Duggal S.K., *"Earthquake Resistant Design of Structures"* 2nd Edition, Oxford University Press, 2008.

3. Relevant Indian Standard Codes: IS-875, IS-1893, IS -4326, IS-13920.

ADVANCED FOUNDATION ENGINEERING

Course Code : 13CE 2211 **L P C**
4 0 3

Course Educational Objectives:

1. To produce civil engineering students who have ability to design foundation systems for structures such as tall towers, bridges etc.
2. To familiarize the student with design of sheet piles and coffer dams.

Course Outcomes:

1. Student will demonstrate the ability to identify a suitable foundation system for a structure.
2. Student will be capable of analyzing and designing foundations for structures such as tall towers, bridges

UNIT – I

Foundation design basics : Criteria for choice of foundation, bearing capacity, total and differential settlement tolerance for various types of structures, Interpretation of soil profile from design parameters like modulus of compressibility, Modulus of sub grade reaction, Poisson's ratio, etc.

UNIT – II

Raft foundations : Raft foundations for building and tower structures, including effects of soil-structure interaction and nonlinearity, different types of rafts

UNIT – III

Deep foundations : Pile foundation-types, methods of installation, codal practices for permissible load under vertical and lateral loads, stresses during pile driving, load carrying capacity of pile groups, negative skin friction, under-reamed piles

Foundation for heavy structures, well foundations, caisson foundations, equipment used for construction of these foundation systems.

UNIT – IV

Machine foundations : Theory of vibrations, free and forced vibrations with and without damping for a single degree freedom system, types of machine foundations, their design criteria, permissible amplitudes and bearing pressure.

UNIT – V

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.

Cofferdams: Stability, bearing capacity, settlements (qualitative treatment only, no designs).

TEXT BOOKS

1. Das, B.M., *"Principles of Foundation Engineering"*, 4th Edition, PWS Publishing, Singapore, 1999

2. Bowles, J.E., *"Foundation Analysis and Design"*, 5th Edition, McGraw- Hill International, 2000

3. Shamsher Prakash, *"Soil Dynamics"*, 3rd Edition, John Willey publications, 2000

REFERENCES

1) Murthy, V.N.S., *"Soil Mechanics and Foundation Engineering"*, 4th Edition ,Sai Krupa Technical Consultants, 2000

2) Venkataramah, C., *"Geotechnical Engineering"*, 5th Edition, NewAge International Pvt.Ltd, Publishers, 2009

3) Swami Saran,*"Analysis and Design of Substructures"*, 2nd Edition, Oxford & IBH Publishing Company Pvt.Ltd 2009.

4) Gopal Ranjan & ASR Rao, *"Basics and Applied Soil Mechanics"*, 3rd Edition, New Age International Pvt.Ltd, Publishers, 2002.

5) Srinivasulu, P and Vaidyanathan, G.V., *"Handbook of Machine Foundations"*, 2nd Edition, Tata McGraw Hill, 1999.

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FINITE ELEMENT METHOD WITH STRUCTURAL APPLICATIONS

Course Code: 13CE 2212 **L P C**
4 0 3

Course Educational Objectives:

1. To familiarize the student with understanding of shape functions and stiffness matrix for various elements used in FEM
2. To create awareness among students about analysis of bars, trusses, beams and frames using FEM

Course Outcomes:

1. Student demonstrate his ability to write suitable shape function and stiffness matrix for a given element
2. Student shall be capable of analyzing a truss, bar, beam and frames using FEM including temperature loads

UNIT- I (10 Lectures)

Introduction : Concept of Finite Element Method - Merits and demerits, applications, relevant software's. Steps involved in FEM as applicable to structural mechanics problems. Descritization interpolation model, Convergence and compatibility criteria.

UNIT-II

Shape Functions - Methods of Determination

Element Stiffness matrix Equation - Derivation of stiffness matrix based on Principle of minimization of Total Potential Energy and Principle of Virtual Work.

Assemblage of Element Stiffness Matrices – Assembly procedure, solution of nodal displacement, Element Stresses and Strains, Interpretation of results, Post processing, Static condensation.

UNIT- III

2D Analysis using FEM : Stiffness Matrix for a Two noded Truss Element, Three noded Truss Element and Two noded Beam Element in Local, and Global (2D)

Stiffness Matrix for a three noded Constant Strain Triangular (CST) Four noded for Plane Stress and Plane Strain Condition.

UNIT- IV

Isoparametric Formulation: Isoparametric, sub-parametric and super parametric Elements, Procedure for Formulation, Advantages of Isoparametric Elements, Shape functions for Isoparametric Elements, Transformation of axes, Co-ordinate systems in FEM - Jacobian – Relevance to FEM.

UNIT-V

Application of F.E.M to Structural Mechanics Problems : Analysis of 2D –Truss, Initial Strain/Rise in Temperature, 3D Truss, Analysis of Propped Cantilevers, Fixed beams, Continuous beams and Portal Frames.

TEXT BOOKS

1. Chandrupatla,T.R., Belegunde, A.D,*"Introduction to Finite Elements in Engineering",* 3rd edition, PHI, 2010.

2. S.S. Bhavikatti, *"Finite Element Analysis"* , 2nd edition, New age international, 2010.

REFERENCES

1. Klaus-Jurgen Bathe, *"Finite Element Methods",* 2nd edition, Prentice Hall, 2010

2. Reddy, J.N., *"Introduction to Finite Element Method",* 3rd Edition, Mc Graw Hill, 2002

3. Desai,Y.M., Eldho.TI, Shah,A.H, *"Finite Element methods with application in Engineering",* 1st edition, Pearson, 2011

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THEORY AND DESIGN OF PLATES AND SHELLS

Course Code: 13CE2213 **L P C**
4 0 3

Course Educational Objectives:

1. To impart the knowledge on elastic of plastic foundations.
2. To familiarize the student with energy methods for plate and shells

Course Outcomes:

1. Student acquire the ability to analyze plate and shells using energy methods.
2. The student will demonstrate the ability to design folded plates and diaphragms.

UNIT – I

Plate equation in Cartesian and polar co-ordinates for Isotropic plates, Analysis of rectangular and circular plates with different boundary conditions and loadings.

UNIT – II

Energy methods in Analysis of plates - Orthotropic plates

UNIT – III

Plates on elastic foundation.

UNIT – IV

Classification of shells - Membrane and bending theory for singly curved and doubly curved shells - Various approximations Design of cylindrical shells, hyperbolic paraboloidal shells, conoids

UNIT – V

Analysis of folded plates - Design of diaphragms

TEXT BOOKS

1. Timoshenko, S. and Wernewsky, *"Theory of plates and shells",* 2nd Edition, Kriegar, 1961.
2. Ramaswamy, G.S., *"Design and Construction of Shells"*, 1st Edition, Mc Graw Hill, 1999.

REFERENCES

1. Flugge, W., *"Stresses in shells",* 2nd Edition, Springer, 2000.
2. Varghee P.C., *"Design of Reinforced Concrete shells and folded plates,* 1st Edition, PHI Publishers, November, 2011.
3. Bandgopadhayag J.N. *"Tier shall Structures", classical and modern analysis",* 1st Edition, New age International (P) Ltd., reprint 2008.

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BRIDGE ENGINEERING
(Elective – II)

Course Code: 13CE 2214

L	P	C
4	0	3

Course Educational Objectives:

1. To impart overall knowledge of about the Analysis and design of RC bridges.
2. To familiarize student with the knowledge of bridge sub structure and bearings.

Course Outcomes:

1. Students should be able to design slab bridges, box culverts and T-beam bridges.
2. To impart the students, with the knowledge of general considerations for road bridges
3. To impart the students, with the knowledge of culverts

UNIT-I

GENERAL CONSIDERATIONS FOR ROAD BRIDGES: Introduction – Site selection – Soil exploration for site – Selection of bridge type – Economical span – Number of spans – Determination of HFL – General arrangement drawing.

STANDARD SPECIFICATIONS FOR ROAD BRIDGES:

Width of carriageway- Clearances- Loads to be considered- Dead load – I.R.C. standard live loads- Impact effect- Review of I.R.C. loadings- Application of live loads on deck slabs – Wind load – Longitudinal forces- Centrifugal forces- Horizontal forces due to water currents – Buoyancy effect- Earth pressure.

UNIT-II

CULVERTS: Introduction, Analysis and design of box culverts- slab culverts – pipe culverts- Reinforcement detailing and bar bending schedule need to be prepared.

UNIT-III

REINFORCED CONCRETE T-BEAM BRIDGES: Introduction – Analysis and Design of T – Beam Girder bridges- Reinforcement detailing and bar bending schedule need to be prepared.

UNIT-IV

DESIGN OF SUBSTRUCTURE: Analysis and Design of abutments and pier- Reinforcement detailing and bar bending schedule need to be prepared.

BRIDGE BEARINGS: Bearings, forces on bearings, design of elastomeric bearings, basics for selection of bearings, expansion joints, and closed joints.

UNIT-V

BRIDGE FOUNDATIONS: Types of foundations, well foundation – open well foundation, components of well foundation – pile foundations (designs not included) - Reinforcement detailing and bar bending schedule need to be prepared.

TEXT BOOKS

1. Johnson victor D, *"Essentials of Bridge Engineering"*, 7th edition, Oxford, IBH Publishing Co., Ltd., 2006.

2. Ponnu Swamy, *"Bridge Engineering"*, 4th edition, Mc Graw-Hill Publication, 2008.

REFERENCES

1. Vazirani, Ratvani & Aswani, *"Design of Concrete Bridges"*, 5th edition, Khanna Publishers, 2006.

2. Jagadish T.R. & M.A. Jayaram, *"Design of Bridge Structures"*, 2nd edition, 2009.

3. Swami Saran, *"Analysis and Design of sub-structures"*, 2nd edition, Oxford IBH Publishing co ltd., 2006.

4. Krishnam Raju N., *"Design of Bridges",* 4th edition, Oxford and IBH Publishing Co., Ltd., 2008.

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PORTS AND HARBOUR STRUCTURES
(Elective – II)

Course Code: 13CE2115

L	P	C
4	0	3

Course Educational Objectives:

1. To impart the knowledge on planning of ports and Harbours.
2. To inculcate in students the understanding of port operations and construction aspects of ports and Harbors.

Course Outcomes:

1. Student will demonstrate the ability to design the infrastructure facility for port and Harbour for a given area.
2. Students will be able to understand the port operations and construction aspects.

UNIT-I

Introduction: Ports and harbours – an infrastructure layer between two transport media, planning of ports and harbours.

The fundamentals: Waves**,** Tide and current conditions inside harbour, water circulation; breakwaters, jetties and quay walls; mooring, berthing and ship motion inside the port; model studies, physical and mathematical studies.

UNIT-II

Design Issues: Sea port layout with regards to (1) wave action (2) siltation (3) navigability berthing facilities.

Design of Port Infrastructures: Design of port infrastructures with regards to (1) cargo handling (2) cargo storage (3) integrated transport of goods, planning multipurpose port terminals.

UNIT-III

Port operations: Allowable wave conditions for cargo handling, wave conditions for human safety on quays and breakwaters, forecasting/nowcasting of wave and current conditions for port operations, dredging and navigability, hazard scenarios; VTMS and management of computerized container terminal, safety and environment (handling of fire, oil spill, rescue, etc.).

UNIT-IV

Inland Waterways and Ports: Maintenance of waterways, construction of environmentally engineered banks, dredging and disposal processing and storing of polluted dredged materials, development of river information services.

UNIT-V

Construction aspects: Planning and construction, expansion and renovation of port and Inland Port Infrastructure.

Sustainability: Global trade and port restructuring/reforms, impact of possible climate change scenarios, sustainable development strategies for cities and ports.

TEXT BOOKS

1. Muir Wood, A.M., and Fleming. C.A.*,"Coastal Hydraulics Sea and Inland Port Structures",* 1st Edition, Hallstead Press, , 2002

2. Ozha & Ozha, *"Dock and Harbour Engineering"*, 1st Edition, Charotar Books, Anand., 1990

REFERENCES

1. S.Seetharaman, *"Construction Engineering and Management",* 4th Edition, Umesh publications, New Delhi, 1999

2. Richand L. SilIster, *"Coastal Engineering Volume I & II"*, Elsevier Publishers, 2000

3. Pera Brunn, *"Port Engineering",* 1st Edition, Gulf Publishing Company, 2001.

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ADVANCED CONCRETE TECHNOLOGY

Course Code: 13CE 2215 **L P C**
4 0 3

Course Educational Objectives:

1. To familiarize the students with various types of cements, concretes and their properties.
2. To impart an awareness of various admixtures for specific concreting purposes.
3. To produce Civil Engineering students who have strong foundation in testing of fresh and hardened concrete.

Course Outcomes:

1. Student will be able to select proper ingredients of concrete and acquire knowledge about the testing of materials for quality assurance.
2. Student will be able to select special concretes for specific purposes.
3. Student will be able to select proper ingredients of concrete and acquire knowledge about the testing of materials for quality assurance.
4. Student will be able to select special concretes for specific purposes.

UNIT I

Properties of cement, fine aggregate and coarse aggregates, Additives and Admixtures in Concrete, Rheology of Concrete

UNIT – II

Manufacturing and methods of concreting, Properties of fresh and hardened concrete, mix design by I.S. method

UNIT –III

Design and manufacture of normal concrete, Light weight concrete – Cellular concrete – No fines concrete – Aerated & foamed concrete

UNIT – IV

Design and manufacture of fiber reinforced concrete – Polymer concrete – Fly ash concrete

UNIT – V

Design and manufacture of Self compacting concrete – High performance concrete – Very high strength concrete – High density concrete

TEXT BOOKS

1. Neville,A.M. and Brookes,J.J., *"Concrete Technology"*, 2nd Edition, Pearson Education, 2010.

2. Gambhir, M.L., *"Concrete Technology"*, 2nd Edition, Tata McGraw Hill Publishers, New Delhi, 2009.

REFERENCES

1. Neville,A.M., "Properties of Concrete", 3rd Edition, Longman Scientific and General, 1992.

2. Shanta Kumar,A.R., *"Concrete Technology"*, 2nd Edition, Oxford University Press, New Delhi, 2000.

3. Krishna Raju.N. " Design of Concrete Mixes", 2nd Edition, CBS Publishers and Distributors, 2009.

4. Shetty, M.S., *"Concrete Technology"*, 3rd Edition, S.Chand Publications, 2008.

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DISASTER MANAGEMENT
(Elective –II)

Course Code: 13CE2216 **L P C**
4 0 3

Course Educational Objectives:

1.To impart knowledge on natural and man-made disasters.
2.To familiarize the student with the knowledge of hazard Analysis and its management

Course Outcomes:

1. Student will be broadly educated about the management of risk and understanding financing relief expenditure, legal aspects, and rescue operations.
2. Students will be able to understand the management of natural disasters and analysis.

UNIT – I

Disasters – Natures and extent of disasters, natural calamities such as earthquake, floods, drought, volcanoes, forest fires, coastal hazards, landslides etc.

Manmade disasters such as chemical and industrial hazards, nuclear hazards, fire hazards etc.

UNIT – II

Disaster Management – Financing relief expenditure, legal aspects, rescue operations.

UNIT – III

Casually management, risk management, emergency management programme – Administrative setup and organization.

UNIT – IV

Hazard Analysis: training of personnel, information management,

Emergency facilities and equipment necessary public awareness creation,

UNIT – V

Preparation and execution of the emergency management programme.

TEXT BOOKS

1. H.K.Guptha, *"Disaster management"*, 2nd Edition, University Press, 2001.

REFERENCES

1. S.Seetharaman, *"Construction Engineering and Management"*, 4th Edition, Umesh publications, New Delhi, 1999
2.Gupta, M.C., *"Manuals on Natural Disaster management in India"*, National Centre for Disaster Management, IIPA, New Delhi, 2002

COMPUTER APPLICATIONS IN STRUCTURAL ENGINEERING LAB

Course Code: 13CE 2217

L	P	C
0	3	2

Course Educational Objective :

To provide the basic knowledge on Analysis and design of framed structures using FEM based software's.

Course Outcomes:

Student will be able to analyze and design a structure for the effects of wind and earthquakes forces using civil engineering software's.

1. Introduction to STAAD Pro software or equivalent.
2. Analysis of continuous beam subjected to different types of loading.
3. Analysis of 2-D building frame for gravity loads.
4. Analysis of 3D frame for gravity loads
5. Earthquake analysis of 3D frames.
6. Wind analysis of 3D frames.
7. Analysis and design of simple bridge deck.
8. Modal Analysis of Buildings and calculating natural frequency.
9. Calculation of mode shapes of R.C. building.
10. Introduction to ANSYS software.
11. Analysis of beams using ANSYS software.
12. Analysis of trusses using ANSYS software.

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