ACADEMIC REGULATIONS

COURSE STRUCTURE AND SYLLABI

FOR

M.TECH.
STRUCTURAL ENGINEERING
(CIVIL ENGINEERING)
2012-2013

GAYATRI VIDYA PARISHAD COLLEGE OF ENGINEERING
(**AUTONOMOUS**)
ACCREDITED BY **NAAC** WITH **A** GRADE WITH A **CGPA** OF **3.47/4.00**
AFFILIATED TO JNTU KAKINADA
MADHURAWADA, VISAKHAPATNAM 530048

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

It is three years since the G.V.P College of Engineering has become Autonomous with the appreciation and support of erstwhile JNTU and the fast growing new JNTU-K. The college is progressing well with its programmes and procedures drawing more and more accolades from its sister autonomous colleges and higher authorities. The student community, also could adjust well to the new system without any acrimony.

The College is enriched with the experience of running the Post-graduate programmes under Autonomous stream. It is a moment of pride and achievement that the first Autonomous batch of M.Tech in some branches left the college to the satisfaction of all concerned including firms visited the campus for placements.

Another larger than canvas picture is foreseen for the programmes wherein the college is getting the funds through TEQIP – II for up-scaling the PG education and research under sub- component 1.2. In this connection two new PG Programmes have been introduced in Mechanical, Electrical Engineering.

New set of Boards of Studies, Academic council and Governing Body has further strengthened our hands by endorsing the practices and suggested recommendations.
The encouragement given by the affiliating JNTU-K has left no task insurmountable.

Principal

MEMBERS ON THE BOARD OF STUDIES IN CIVIL ENGINEERING

- Prof.Manchikanti Srinivas, Head of the Department.

- Dr. B. Sivarama Sarma, Head R&D, L&T Construction Research & Testing Centre, Chennai.
- Prof. D.S.R. Murthy, Department of Civil Engg., A.U., Visakhapatnam.
- Prof. P. Uday Bhaskar, Department of Civil Engg., JNTU-K.
- Prof. D. Nagesh Kumar, Water Resources & Environmental Engg., Dept. of Civil Engg. , IISc., Bangalore.
- Dr. K. Raja Gopal, Professor in Civil Engineering, IIT Madras.
- Sri K. Ravi Kumar, Project Director, Sheladia Inc., Visakhapatnam.
- Ms. Hasini Alahari , M.Tech., GVPCOE.

All faculty of the department.

ACADEMIC REGULATIONS

(Effective for the students admitted into
first year from the academic year 2012-2013)

The M.Tech Degree of JNTU-KAKINADA shall be recommended to be conferred on candidates who are admitted to the program and fulfill all the requirements for the award of the Degree.

1.0 ELIGIBILITY 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 will normally be 20 weeks with 5 days a week. A working day shall have 7 periods each of 50minutes.

3.0 COURSES OF STUDY:

M.TECH. COURSES	INTAKE
Chemical Engineering	18
Computer Science and Engineering	18
CAD/CAM	18
Infrastructural Engineering and Management	18
Structural Engineering	18
Power System Control and Automation	18
Embedded Systems & VLSI Design	18
Communications & Signal Processing	18
Software Engineering	18
Power Electronics & Drives	18
Computer Aided Analysis And Design (CAAD)	18

4.0 ATTENDANCE:

The attendance shall be considered subject wise.

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

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 should re-register and repeat those subjects as and when 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.

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

5.0 EVALUATION:

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

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 Examination and a minimum aggregate of 50% of the total marks in 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, 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 Mid–Term Examinations of 30 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, shall collect the literature on a topic and critically review the literature and submit it to the Department in a report form and shall make an oral presentation before the Departmental Committee. The Departmental Committee consists of the Head of the Department, supervisor 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. For Seminar in I, II Semesters in case of the course structure of having 5 Theory + 2 Labs. + 1 Seminar, a student has to deliver a seminar talk in each of the subjects in that semester which shall be evaluated for 10 marks each and average marks allotted shall be considered. A letter grade from A to C corresponding to the marks allotted may be awarded for the two credits so as to keep the existing structure and evaluation undisturbed.

A – Excellent	(average marks $\geq$ 8)
B – Good	(6$\leq$ average marks <8)
C – Satisfactory	(5$\leq$ average marks <6)

If a satisfactory grade is not secured, one has to repeat in the following semester.

f. In case the candidate does not secure the minimum academic requirement in any subject (as specified in 4.0 a, 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 are less than 50% and he has failed in the end examination. In such a case the candidate must re-register for the subject (s) and secure required minimum attendance. Attendance in the re-registered subject (s) has to be calculated separately to become eligible to write the end- examination in the re-registered subject(s). In the event of re-registration, the internal marks and end examination marks obtained in the previous attempt are nullified.

g. In case the candidates secure less than the required attendance in any subject(s), he shall not be permitted to appear for the End Examination in that subject(s). He shall re-register for the subject(s) when next offered.
h. 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 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 to submission.
b. A Central Research Committee (CRC) shall be constituted with a Senior Professor as chair person, Heads of all the

Departments which are offering the M.Tech programs and two other senior faculty members.

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 approval of DRC. However, the Departmental Project Review 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.
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. The dissertation shall be adjudicated by one examiner selected by the Principal. For this HOD shall submit in consultation with the supervisor a panel of 5 examiners, who are experienced in that field.
j. If the report of the examiner is not favorable, the candidate shall revise and resubmit the dissertation, in a time frame as prescribed by the CRC. If the report of the examiner is unfavorable again, the dissertation shall be summarily rejected then the candidate shall change the topic of the Project and option shall be given to change the supervisor also.
k. If the report of the examiner is favorable, viva-voce examination shall be conducted by a board consisting of the supervisor, Head of the Department and the examiner who adjudicated the dissertation. The Board shall jointly report candidate's work as:
   A. Excellent
   B. Good
   C. Satisfactory

7.0 AWARD OF DEGREE AND CLASS :

A candidate shall be eligible for the respective 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 marks in internal evaluation and end examination shall be shown separately in the marks memorandum.

The grade of the dissertation shall also 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 will 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 such cases.

9.0 TRANSITORY REGULATIONS:

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 6.0 e and 2.0

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.

***

COURSE STRUCTURE

I SEMESTER

COURSE CODE	Theory / Lab	L	P	C
11CE2201	Advanced Design of Concrete Structures	4	-	4
11CE2202	Optimization techniques	4	-	4
11CE2203	Structural Dynamics	4	-	4
11CE2204	Advanced Methods of Structural Analysis	4	-	4
11CE2205	Theory of Elasticity and Plasticity	4	-	4
	Elective – I	4	-	4
11CE2206	Prestressed Concrete.			
11CE2207	Power Plant Design			
11CE2208	Stability of Structures			
11CE2209	Industrial Structures			
11CE2210	Experimental Techniques in Structural Engineering	0	3	2
	Total	**24**	**3**	**26**

II SEMESTER

COURSE CODE	Theory / Lab	L	P	C
11CE2211	Advanced Design of Steel Structures	4	-	4
11CE2212	Wind and Earthquake Resistant Design of Structures	4	-	4
11CE2213	Advanced Foundation Engineering	4	-	4
11CE2214	Finite Element Methods	4	-	4
11CE2215	Theory and Design of Plates and shells	4	-	4
	Elective- II	4	-	4
11CE2216	Bridge Engineering			
11CE2217	Port & Harbour Structures			
11CE2218	Advanced Concrete Technology			
11CE2219	Disaster Management			
11CE2220	Computer Applications in Structural Engineering	0	3	2
	Total	**24**	**3**	**26**

III SEMESTER

COURSE CODE	THEORY/LAB	L	P	C
	Commencement of Project Work			
11CE22S1	SEMINAR	**-**	**-**	**2**

IV SEMESTER

COURSE CODE	THEORY/LAB	L	P	C
11CE2221	PROJECT WORK DISSERTATION / THESIS EXCELLENT/GOOD/SATISFACTORY/ NON-SATISFACTORY	**-**	**-**	**56**

ADVANCED CONCRETE STRUCTURES

Course Code: 11CE2201

L	P	C
4	0	4

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, Deflection calculation by Eurocode, ACI simplified method, Deflection of continuous beams by IS 456, Deflection of slabs.

UNIT - II

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 - III

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 - IV

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

UNIT - VI

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 - VII

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

UNIT - VIII

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

Text books

1.Bhavikatti S. S. "Advance RCC Design". New Age International Pvt Ltd, 3rd Edition, 2008.

2.Krishna Raju, N. "Design of Reinforced Concrete Structures", CBS Publishers and Distributors. New Delhi, 2nd Edition, 2007

References:

1. Varghese P.C. “Advanced Reinforced Concrete Design”, Prentice-Hall of India, 2nd Edition, 2008

2. Unnikrishnanpillai and Devadas Menon, Reinforced Concrete Design, Tata McGraw-Hill Publishing Co Ltd, 2nd Edition, 2003.

3. I.S.456 2000, “Code of Practice for plan & reinforced centre”, BIS-2000.

4. S.P-16, “Design Aids for Reinforced Concrete to IS : 456.

5. Purushothaman, P., Reinforced Concrete Structural Elements, Tata Mc Graw- Hill PublishingCo, 3rd Edition, 2004

***

OPTIMISATION TECHNIQUES

	L	P	C
Course Code :11CE2202	**4**	**0**	**4**

UNIT - I :
Structural Optimization :
Formulation of Structural Optimization problems: Design variables - Objective function - constraints. Fully stressed design.

UNIT - II
Review of Linear Algebra: Vector spaces, basis and dimension, canonical forms. Linear Programming: Revised Simplex method, Minimum weight design and rigid frame.

UNIT - III
Optimization applications in structural engineering

UNIT - IV
Nonlinear Programming: Deterministic Methods_ Unconstrained and constrained Optimization - Kuhn-Tucker conditions, Direct search and gradient methods

UNIT - V
One dimensional search methods - DFP and BFGS algorithms, constrained Optimization - Direct and Indirect methods - SLP, SQP and SUMT, Application of NLP methods to optimal structural design problems.

UNIT - VI
Optimality criteria based methods, Reanalysis techniques - Approximation concepts - Design sensitivity Optimization of

sections, steel and concrete structures - framed structures, bridge structures. Stochastic Optimization Methods:

UNIT - VII

Genetic Algorithms - Binary coding- Genetic Operators - Simple Genetic Algorithm (SGA) and variable length Genetic Algorithm (VGA). Simulated annealing.

UNIT - VIII

Applications to discrete size, Configuration and shape optimization problems. Artificial Intelligence and Artificial Neural Networks based approaches for structural optimization problems.

Text Books

1. Rao S.S. "Optimization, Theory and Applications", Wiley Eastern Ltd, 2nd Edition, 2001

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

References

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

***

STRUCTURAL DYNAMICS

Course Code: 11CE2203

L	P	C
4	0	4

UNIT - I

One Degree Systems: Undamped systems, Various forcing functions damped systems, Response to pulsating force, Support motion.

UNIT - II

Lumped Mass Multidegree System: Direct determination of natural frequencies, Characteristic shapes, Modified Rayleigh-Ritz method.

UNIT - III

Lagrange's equation, Model analysis of multi degree systems, Multistorey rigid frames subjected to lateral loads, Damping in multi degree systems.

UNIT - IV

Structures with distributed mass and load, Single span beams, Normal modes of vibration, Forced vibrations of beams, Beams with variable cross-section and mass.

UNIT - V

Matrix Approach: Coordinates and lumped masses, Consistent mass matrix, Undamped force vibration of a system with one degree freedom, Response of single degree freedom undamped system.

UNIT - VI

Viscous damped vibration of a single degree freedom system, Undamped vibration of multi degree freedom system, Orthogonality of natural nodes, Normal coordinates.

UNIT - VII

Numerical Methods: Wilson and Newmark.

UNIT - VIII

Mode superposition method & Modal truncation errors - Modal Acceleration method, Direct Integration methods - Explicit and Implicit methods. Overview of random vibrations.

Text Books

1. Chopra A. K., "Dynamics of Structures". Prentice Hall, 3rd Edition, 2006

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

References

1. Raymond W. Clough, Joseph Penzien . "Dynamics of Structures". Mc Graw-Hill Book Company, 3rd Edition, 2008

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

***

ADVANCED METHODS OF STRUCTURAL ANALYSIS

Course Code: 11CE2204

L	P	C
4	0	4

UNIT I
Analysis of Axially loaded bars, beams and portal frames by Rayleigh Ritz method

UNIT II
Analysis of Axially loaded bars, beams and portal frames by Gelarkin's method

UNIT – III
Analysis of beams and plates by Finite Difference Method

UNIT – IV
Analysis of Statically determinate and Indeterminate beams, Frames and Trusses by Stiffness method

UNIT –V
Analysis of Statically determinate and Indeterminate beams, Frames and Trusses by Flexibility method

UNIT – VI
Approximate methods of analysis of Multi-storey frames

UNIT – VII
Influence lines for indeterminate beams, Arches and Trusses

UNIT VIII
Cables and suspension bridges

Text Books

1. Wang C. K., "Indeterminate Structural Analysis", McGraw-Hill, 2nd Edition, 2000.

2. Sinha, N. C. and Gayen, P. K., Advanced theory of structures, Dhanpat Rai & Sons, 4th Edition, 2002

Reference Books

1. Reddy C.S., Basic Structural Analysis, Tata McGraw Hill Publishing Co., 3rd edition, 2001

2. Hibbeler R.C, Structural Analysis, Macmillan Pub.Co., 2nd Edition, 2000

3. Au T and Christiano, P., Structural analysis, Prentice Hall, 1st Edition, 2002

***

THEORY OF ELASTICITY AND PLASTICITY

Course Code: 11CE2205

L	P	C
4	0	4

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

UNIT II

Principal stresses and strains, Stress and strain invariants, hydrostatic and deviatoric stress and strains.

UNIT III

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 IV

Stress-strain relations for linearly elastic solids, Generalized Hooke's law. Solution of axisymmetric problems, stress concentrations due to presence of a circular hole.

UNIT V

Elementary problems of elasticity in three dimensions

UNIT VI

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

UNIT VII

Plasticity: Physical Assumptions – Yield criteria - Tresca and Von Mises criterion of yielding, Plastic stress strain relationship, Elastic plastic problems in bending.

UNIT VIII

Some engineering applications of elasticity and plasticity

Text Books

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

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

Reference Books

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

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

***

PRESTRESSED CONCRETE
(Elective – I)

Course Code: 11CE2206 **L P C**
4 0 4

UNIT I
Materials, Prestressing Systems, End Anchorages.

UNIT II
Loss of Prestress

UNIT III
Analysis and Design of Sections for Flexure.

UNIT IV
Design for Shear, Bond and Bearing.

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

UNIT VI
Partial Prestress and Non-prestressed Reinforcements.

UNIT VI
Slabs. Tension Members; Circular Prestressing. Compression Members; Piles.

UNIT VIII
Structural systems and economics.

Text Books:

1. Krishna Raju,N., Design of Prestressed Concrete Srtuctures, TMH, 4th Edition, 2004

2. Lin., T.Y., Design of Prestressed Concrete Srtuctures, John Wiley & Sons, 2nd Edition, 1999

Reference Books:

1.Edward G. Nawy, "Prestressed Concrete: A Fundamental Approach", Prentice Hall, 1st Edition, 2002

***

POWER PLANT DESIGN
(Elective – I)

Course Code: 11CE2207

L	P	C
4	0	4

UNIT – I
Power Plants : Planning and Layout of different types of Power plants.

UNIT – II
Chimneys: Analysis and Design of Chimneys. IS codal provisions.

UNIT – III
Cooling Towers : Induced draught and natural draught cooling towers.

UNIT – IV
Foundation: Machine foundations & Turbo generator foundations.

UNIT – V
Material Handling Structures: Silos and Bunkers

UNIT – VI
Intake Towers: Dams, wells and Intake galleries

UNIT – VII
Storage Structures: Analysis and Design of ware house structures.

UNIT – VIII
Supporting structures for equipment: Introduction, Analysis and Design

Text Books:

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

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

References Books:

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

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

***

STABILITY OF STRUCTURES
(Elective – I)

Course Code: 11CE2208 **L P C**
4 0 4

UNIT - I
Criteria for design of structures: stability, strength, and stiffness;

UNIT - II
Classical concept of stability; Stability of discrete systems: linear and nonlinear behaviour;

UNIT - III
Stability of continuous systems: stability of columns: axial–flexural buckling, lateral bracing of columns,

UNIT - IV
Combined axial-flexural-torsion buckling;

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

UNIT - VI
Stability of beams: lateral-torsion buckling;

UNIT - VII
Stability of plates: axial-flexural buckling, shear flexural buckling, buckling under combined loads;

UNIT - VIII
Introduction to inelastic buckling and dynamic stability.

Text books and References.

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

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

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

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

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

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

7. Galambos,T.V., Guide to stability design criteria for metal structures, Wiley, NY, 2nd Edition, 2000

***

INDUSTRIAL STRUCTURES
(Elective – I)

Course Code: 11CE2209

L	P	C
4	0	4

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 land planning 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

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

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- IV

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 -V

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

UNIT- VI

INDUSTRIAL FLOORS AND ROOFS: Classification of plates and shells – principles involved in the analysis and design of plates, shells and cable stayed structures. Approximate analysis and design of single layered and double layered steel grids. Steel – Concrete composite floors. Introduction to Grid floors and Flat slabs

UNIT -VII

BUNKERS, SILOS AND CHIMNEYS: Analysis and Design of Bunkers, Silos and Chimneys

UNIT- VIII

PREFABR1CATION 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

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

3. Large Panel Prefabricated Constructions, Proc. of Advance Course by SERC, Madras, 2004

4. National Building Code, BIS, New Delhi, 2005

5. Subrahmanyam, N., Space Structures. Wheeler & Co., Allahabad, 1st Edition, 1999

***

EXPERIMENTAL TECHNIQUES IN STRUCTURAL ENGINEERING

Course Code:11CE2210

L	P	C
0	3	2

1. Elastic properties of concrete
2. Elastic properties of steel
3. Shear capacity of R.C. beams
4. Flexural capacities of R.C. Beams
5. Non-Destructive testing of Concrete
6. Strength evaluation of masonry structures
7. Strain measurement of using strain gauges
8. Dynamic properties of Engineering materials
9. Double shear test on steel

***

ADVANCED DESIGN OF STEEL STRUCTURES

Course Code: 11CE2211

L	P	C
4	0	4

UNIT I
Design of Foot Bridge (N-Truss and Pratt)

UNIT II
Analysis and design for transmission tower line.

UNIT III
Design of self supporting steel chimneys including foundations

UNIT IV
Design of Through type truss bridge member for dead load and equivalent live load including top, bottom bracings and portal bracing.

UNIT V
Design of industrial building including gantry girder, gantry column, and design of knee braces.

UNIT VI
Design of North light trusses and Lattice girder.

UNIT VII
Design of elevated rectangular, square pressed steel tanks including staging.

UNIT VIII
Design of pre-engineered building systems.

Note: Candidate should use the latest IS codes.

Text books:

1. Ramchandra. "Design of Steel Structures Vol. I & II", Standard Book House, New Delhi, 3rd Edition, 1998

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

Reference Books:

1. IS 800-2007
2. BIS SP 36
3. MBMA and AISC Hand Books

***

WIND AND EARTHQUAKE RESISTANT DESIGN OF STRUCTURES

Course Code: 11CE2212

L	P	C
4	0	4

EARTHQUAKE ENGINEERING

UNIT - I

Engineering Seismology, Ground Motion parameters, Design philosophy, Code provisions.

UNIT - II

Inelastic Design Response Spectra (IDRS), Response reduction factors, Push-over analysis, Inelastic cyclic behaviour of steel and reinforced concrete structures, ductility and energy dissipation capacity, Principles of Capacity Design.

UNIT - III

Ductile detailing of RC members and joints, Design and detailing of Steel structures including braced and moment-resistant frames, Damage evaluation and retrofit techniques, experimental techniques.

UNIT - IV

Aseismic 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.

WIND ENGINEERING

UNIT - V

Application of relevant IS codes to practical design Wind gust loading:- Basic concepts, spectral description structural response of the line-like structure.

UNIT - VI

Aerodynamics damping Aerodynamics instability: Vortex shedding, Along wind and ovalling excitation - design impact and counter measures, Aeroelastic excitation: galloping - flutter.

UNIT - VII

Design Wind speeds and risk coefficients,

UNIT - VIII

Design wind pressure and pressure coefficients, Vortex shedding, gust factors, wind tunnel testing.

Text Books

1. John M. Biggs. "Introduction to Structural Dynamics", McGraw-Hill, 1st Edition, 1996

2. Ghali A., Neville A. M. "Structural Analysis- A Unified Classical and Matrix Approach", Eswar Press, 2nd Edition, 1999.

3. Duggal S. K. "Earthquake Resistant Design of Structures". Oxford University Press, 1st Edition, 2005

Reference Books

1. Jaikrishna and Chandrasekharan, "Elements of Earthquake Engineering". Saritha Prakasham, Meerut, 1st Edition, 2000

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

3. IS Codes: IS-875, IS-1893.

***

ADVANCED FOUNDATION ENGINEERING

Course Code: 11CE2213 **L P C**
4 0 4

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 subgrade 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 - I
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

UNIT – IV Deep foundations - II
Foundation for heavy structures, well foundations, caisson foundations, equipment used for construction of these foundation systems.

UNIT – V 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 – VI 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 – VII Cofferdams

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

UNIT – VIII Ground Improvement techniques (only concept, no design)

Vibration at the ground surface and at depth, sand drains, stone columns, Stabilization using chemicals, cement and by mechanical means, functions and applications of geotextiles, geogrids, and geomembranes.

TEXT BOOKS

1. Das, B.M., Principles of Foundation Engineering, PWS Publishing, Singapore, 4th Edition 1999
2. Bowles, J.E., Foundation Analysis and Design, McGraw- Hill International, 5th Edition, 2000
3. Srinivasulu, P and Vaidyanathan, G.V., "Handbook of Machine Foundations", Tata McGraw Hill, 2nd Edition, 1999
4. Shamsher Prakash, "Soil Dynamics", John Wiley publications, 3rd Edition, 2000
5. Purushotham Raj, Ground Improvement Techniques, Laxmi Publications, 3rd Edition, 2009,

REFERENCES

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

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

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

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

5). Moseley M.P., Ground Improvement, Blackie Academic and Professional, 1st Edition, 1996

6). Robert M. Koerner, Designing with Geosynthetics, Prentice Hall, 2nd Edition, 1992

FINITE ELEMENT ANALYSIS

Course Code: 11CE2214

L	P	C
4	0	4

UNIT- I : INTRODUCTION

Concept of Finite element Method - Weak from development. Merits and Demerits, Applications. Relevant Softwares. Steps involved in FEM as applicable to Structural Mechanics Problems. Descritization

UNIT-II: CHOICE OF DISPLACEMENT MODEL, FORMULATION OF ELEMENT STIFFNESS MATRIX

Choice of displacement interpolation model - Convergence and Compatiabilty criteria, Geometric Invariance and Pascal's Criteria, Patch Test, Confirming and non-confirming elements, Complete Elements, C0, C1 and C2 Continuity.

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

UNIT-II:SHAPE FUNCTIONS AND STRAIN DISPLACEMENT MATRIX

Shape Functions - Methods of Determination

Assemblage of Element Stiffness Matrices – Assembly procedure, solution of nodal displacement, Element Stresses and Strains, Interpretation of Results, Post processing

UNIT- IV : 2D ANALYSIS USING F.E.M

Stiffness Matrix for a Two noded Truss Element, Three noded Truss Element and Two noded Beam Element in Local, Global (2D), Natural and Generalised Co-ordinate Systems.

Stiffness Matrix for a Three noded C.S.T and L.S.T elements, Four noded and Eight noded Rectangular and Quadrilateral in Global Co-

ordinate System and Generalised Co-ordinate System for Plane Stress and Plane Strain Condition

UNIT- V: ISOPERAMETRIC FORMULATION AND 3D ANALYSIS USING F.E.M

Isoperametric, sub-parametric and super parametric Elements, Procedure for Formulation, Advantages of isoperametric Elements, Shape functions for Isoperametric Elements, Transformation of axes, Co-ordinate systems in FEM - Local, Global (2D), Natural, Generalised Area and Volume Co-ordinates. Jacobian – Relevance to FEM.

UNIT- VI : 3D ANALYSIS

Stiffness Matrix for 2 noded Truss Element in 3D Global Co-ordinate System, Stiffness Matrix for 2 noded Beam Element in 3D Global Co-ordinate System, Tetrahedron element

UNIT-VII : APPLICATION OF F.E.M TO STRUCTURAL MECHANICS PROBLEMS

Analysis of 2D –Truss, 2D –Truss with initial Strain/Rise in Temperature, 3D Truss, Analysis of Propped Cantilevers, Fixed beams, Continuous beams, Portal Frames, Multi-storey frames, Grids and Plates.

UNIT VIII MORE APPLICATIONS

Solution of Plane stress, Plane strain and Axisymmetric problems

Text Books

1. Reddy, J.N., Introduction to Finite Element Method, Mc Graw Hill, 3rd Edition, 2006
2. Rao, S.S., Introduction to Finite Element Methods, Elsevier, 2nd Edition, 2006
3. Chandrupatla,T.R., Belegunde, A.D,"Introduction to Finite Elements in Engineering", Prentice Hall, 2nd Edition, 2007

References:

1. Klaus-Jurgen Bathe, Finite Element Methods, Prentice Hall, 1st Edition, 1999

THEORY AND DESIGN OF PLATES AND SHELLS

Course Code: 11CE2215 **L P C**
4 0 4

UNIT - I
Plate equation in cartesian and polar co-ordinates for isotropic plates

UNIT - II
Analysis of rectangular and circular plates with different boundary conditions and loadings –

UNIT - III
Energy methods in analysis of plates - Orthotropic plates –

UNIT - IV
Plates on elastic foundation.

UNIT - V
Classification of shells - Membrane and bending theory for singly curved and doubly curved shells - Various approximations

UNIT - VI
Design of cylindrical shells, Hyperbolic paraboloidal shells, conoids

UNIT - VII
Analysis of folded plates - Design of diaphragms

UNIT - VIII
Detailing of reinforcements for shells - Framework for shells and folded plates.

Text Book:

1. Timoshenko, S. and Wernewsky, "Theory of plates and shells ", Kriegar, 2nd Edition, 1961

2. Ramaswamy, G.S., "Design and Construction of Shells ", Mc Graw Hill, 1st Edition, 1999

References:

1. Flugge, W., "Stresses in shells", Springer, 2nd Edition, 2000

***

BRIDGE ENGINEERING
(Elective – II)

Course Code: 11CE2216 **L P C**
4 0 4

Bridge Engineering

UNIT - I
Introduction - Classification and components of bridges, historical perspective, layout and planning, investigations for Bridges, choice of type of the bridges,

UNIT - II
Conceptual bridge design, bridge aesthetics. bridge accessories.

UNIT - III
Loads on bridges - loading standards for highway and railway bridges (IRC, IRS)

UNIT - IV
Design of RC slab, skew slab and box culverts. Design of T beam bridges – balanced cantilever bridges – rigid frame bridges.

UNIT - V
Behaviour, analysis and design of RC and PSC box-girder bridge decks. Behaviour, analysis and design of steel bridge decks: girder bridges, truss bridges, arch bridges, Bow string girder bridges, composite construction.

UNIT - VI
Design of different types of bearings.

UNIT - VII
Foundation systems - design and constructional aspects.

UNIT - VIII

Modern methods of construction of concrete, steel and composite bridges, their impact on analysis and design. Introduction to analysis and design of long span bridges, suspension and cable stayed bridges.

Text books:

1.Johnson Victor D., "Essentials of bridge Engineering"- Oxford, IBH Publishing Co., 2nd Edition, 1998

2.Ponnuswamy, "Bridge Engineering", McGraw Hill Publication, 1st Edition, 2003

Reference Books:

1. Vazirani Ratwani & Aswani, M.G., "Design of Concrete Bridges", Khanna Publishers, 1st Edition, 1997

2. Krishna Raju N., "Design of Bridges", Oxford & IBH Publishing Co. Ltd., 3rd Edition, 2004

3. Jayaram M.A., "Analysis and design of Bridges", Sapna Publishers, Bangalore, 1st Edition, 2008

***

PORTS AND HARBOUR STRUCTURES
(Elective – II)

Course Code: 11CE2217

L	P	C
4	0	4

UNIT-I

Introduction: Ports and harbours as the interface between the water and land infrastructure – an infrastructure layer between two transport media.

UNIT-II

The fundamentals: Wave conditions inside harbour, water circulation; breakwaters, jetties & quay walls; mooring, berthing and ship motion inside the port; cargo handling – bulk material storage & handling.

UNIT-III

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

UNIT-IV

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-V

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

UNIT-VI

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

UNIT-VII

Construction Aspects : Planning and construction of expansion and renovation of existing Inland Port Infrastructure.

UNIT-VIII

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", Hallstead Press, 1st Edition, 2002

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

References:

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

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

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

***

ADVANCED CONCRETE TECHNOLOGY

Course Code: 11CE2218

L	P	C
4	0	4

UNIT I
Properties of Cement, Fine aggregate and Coarse aggregates
UNIT – II
Additives and Admixtures in Concrete
UNIT III
Rheology of Concrete
UNIT – IV
Manufacturing and methods of concreting
UNIT – V
Properties of Fresh and hardened Concrete
UNIT –VI
Design and manufacture of Normal Concrete, Light weight concrete – Cellular concrete – No fines concrete – Aerated & foamed concrete
UNIT – VII
Design and manufacture of Fiber reinforced concrete – Polymer concrete – Flyash concrete
UNIT – VIII
Design and manufacture of Self compacting concrete – High performance concrete – Very high strength concete – High density concrete

Text Books

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

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

References

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

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

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

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

***

DISASTER MANAGEMENT
(Elective –II)

Course Code: 11CE2219

L	P	C
4	0	4

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

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

UNIT - III
Disaster Management – Financing relief expenditure, legal aspects, rescue operations

UNIT - IV
Casually management, risk management.

UNIT - V
Emergency Management programme – Administrative setup and organization.

UNIT - VI
Hazard analysis, training of personnel, information management,

UNIT - VII
Emergency facilities and equipment necessary public awareness creation,

UNIT – VIII

Preparation and execution of the emergency management programme.

Text Book

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

Reference Books

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

Course Code: 11CE2220

L	P	C
0	3	2

STAAD PRO

1. Introduction
2. Analysis and Design of Bridges
3. Analysis and Design of Transmission line tower

STRUDDS

4. Introduction
5. Analysis and Design of multi storey building
6. Earthquake analysis and design of multi storey building
7. Wind analysis and design of multi storey building

ANSYS

8. Introduction
9. Static Analysis
10. Modal Analysis