ACADEMIC REGULATIONS
COURSE STRUCTURE
AND
DETAILED SYLLABUS
(Choice Based Credit System)

R24

STRUCTURAL ENGINEERING

For

Master of Technology (M.Tech)

(Applicable for batches admitted from 2024-2025)

SWARNANDHRA

COLLEGE OF ENGINEERING & TECHNOLOGY
(AUTONOMOUS)

SEETHARAMAPURAM, NARSAPUR-534 280, W.G.DT., A.P.

Academic Regulations (R24) for M. Tech

(Effective for the students admitted into I year from the Academic Year **2024-25** onwards)

1. INTRODUCTION

Swarnandhra College of Engineering & Technology (Subsequently referred to as SCET) will be followed the norms of Jawaharlal Nehru Technological University Kakinada and Govt. of Andhra Pradesh.

Academic Programmes of the institute are governed by rules and regulations approved by the Academic Council, which is the highest Academic body of the Institute. These rules and regulations are applicable for the students of M. Tech (Regular) Course from the Academic Year 2024-25 onwards.

2. ADMISSIONS:

2.1. Admission into first year of M. Tech Programme:

Admissions in each M.Tech program in the Institution are classified into **CATEGORY-A** through convener, PGECET and **GATE CATEGORY- B** seats are filled by the college management.

2.2. Admissions with advance standing:

These may arise in the following cases:

a) When a student seeks transfer from other colleges to SCET and desirous to pursue the study at SCET in an eligible branch of study.
b) When students of SCET get transferred from one regulation to another regulation or from previous syllabus to revised syllabus.
c) When a student after long discontinuity rejoins the college to complete his/her Program of study for the award of degree.

In all such cases for admission, when needed, permissions from the statutory bodies are to be obtained and the Programme of study at SCET will be governed by the transitory regulations.

3. DURATION OF THE PROGRAMME AND MEDIUM OF INSTRUCTION:

The duration of the M. Tech. Program is two academic years consisting of four semesters. Students, who fail to fulfill all the academic requirements for the award of the degree within minimum of four academic years, will forfeit their admission in M. Tech course**.** The medium of instruction and examinations are in English.

4. PROGRAMMES OF STUDY:

The following specializations are offered at present.

i) M. Tech – Power Electronics
ii) M. Tech – CAD/CAM
iii) M. Tech – VLSI System Design
iv) M. Tech – Communication Systems
v) M. Tech – Computer Science & Engineering
vi) M. Tech – Thermal Engineering
vii) M. Tech – Structural Engineering

5. AWARD OF M. TECH DEGREE

- The candidate pursues a course of study in not less than two and not more than four academic years.
- The student shall register for all 68 credits and secure the same.

6. ATTENDANCE

The minimum instruction days in each semester are 90.

i. A student will be eligible to appear for end semester examinations, if he/she acquired a minimum of 75% of attendance in aggregate of all the courses.
ii. Condonation of shortage of attendance in aggregate up to 10% on medical grounds (Above 65% and below 75%) in any semester may be granted by the College Academic Committee.
iii. Shortage of Attendance below 65% in aggregate shall not be condoned
iv. Students with less than 65% of attendance in any semester are not eligible to take up their end examination of that particular semester and their registration for examination shall be allowed.
v. Attendance may also be condoned for those who participate in Intercollegiate/university sports, co- and extracurricular activities provided their attendance is in the minimum prescribed range for the purpose (>65%) and recommended by the concerned authority. He/ She shall pay the prescribed condonation fee.
vi. Prescribed Condonation fee shall be payable by the student to appear for the end examination.
vii. A Student will not be promoted to the next semester unless he/she satisfies the attendance requirement of the present semester as applicable. They may seek re-admission for that semester as and when offered consecutively by the Department.

7. EVALUATION

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

7.1 Continuous Internal Evaluation:

Theory

(a) For theory subjects, during a semester, there shall be two mid-term examinations. Each midterm examination shall be conducted for a total duration of 120 minutes with 4 questions (without choice) each question for 10 marks.
(b) The descriptive examination is set with 4 full questions from first two and half units (50% of the syllabus), the student has to answer all questions. In the similar lines, descriptive examination shall be conducted on the rest of the syllabus.
(c) The first mid (Mid-1) marks shall be submitted to the examination section within one week after completion of first mid examination.
(d) The mid marks submitted to the examination section shall be displayed in the concerned department notice boards for the benefit of the students.
(e) If any discrepancy found in the submitted Mid-1 marks, it shall be brought to the notice of examination section within one week from the submission.

(f) Second mid examination shall be conducted on the similar lines of mid-1 and its mid (Mid-2) marks shall also be submitted to examination section within one week after completion of second mid examination and it shall be displayed in the notice boards. If any discrepancy found in the submitted mid-2 marks, it shall be brought to the notice of examination section within one week from the submission.
(g) The final marks are the sum of average of two mid-term examinations i.e. $\frac{\textbf{Mid1}+\textbf{Mid2}}{\textbf{2}}$

7.2 End Semester Theory Examination Evaluation:

Theory:

- End semester examination is conducted for 60 marks. Question paper consists of five questions from five units with internal choice. Duration of exam is 180 minutes.

7.3 Laboratory Evaluation:

Internal Evaluation: The internal marks for laboratory are 40 marks and the marks shall be awarded based on the day to day work: 10 marks, Record: 5 marks and the remaining 25 marks to be awarded by conducting an internal laboratory test.

External Evaluation: For external marks for laboratory are 60 and marks shall be awarded based on the performance in the end laboratory examinations. Laboratory examination must be conducted with two Examiners, one of them being the Laboratory Class Teacher and the second examiner shall be appointed by the COE from the panel of examiners submitted by the respective college. Laboratory examination must be conducted with a breakup mark of Procedure-15, Experimentation-25, Results-10, Viva-voce-10.

7.4 For MOOCs Course, the student shall register for the course (Minimum of 12 weeks) offered by SWAYAM/NPTEL/JNTUK MOOCs through online with the approval of committee comprises of Head of the Department and two senior faculty. The Head of the Department shall appoint one mentor for each of the MOOC courses offered. The student needs to earn a certificate by passing the exam. The student will be awarded the credits given in curriculum only by submission of the certificate.

7.5 A candidate shall be deemed to have secured the minimum academic requirement in a course if he secures a minimum of 40% of marks in the End semester Examination and a minimum aggregate of 50% of the total marks in the end semester Examination and Internal.

7.6 A candidate shall be given one chance to re-register for each course provided the internal marks secured by a candidate are less than 50% and has failed in the end examination after completion of the third semester. The candidate's attendance in the re- registered course(s) shall be calculated separately to decide upon his/her eligibility for writing the end examination in those courses(s). In the event of the student taking another chance, his internal marks and end examination marks obtained in the previous attempt stand cancelled. For re-registration the candidates have to apply to the Institute by paying the requisite fees and get approval from the concern authorities before the start of the semester in which re-registration is required. In case the candidate secures less than the required attendance in any re-registered course(s), he/she shall not be permitted to write the End Examination in that course.

7.7 Laboratory external examination must be conducted with internal and external examiner. External examiner will be appointed by the COE from the approved panel of examiners.

7.8 For non-credit Audit Courses, "Satisfactory" or "Unsatisfactory" shall be indicated instead of the letter grade and this will not be counted for the computation of SGPA/CGPA/Percentage.

7.9 For Mini Project with 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 Project Review Committee consisting of Head of the Department, supervisor/mentor and two other senior faculty members of the department. For Mini Project with Seminar, there will be only internal evaluation of 50 marks. A candidate has to secure a minimum of 50% of marks to be declared successful.

8. EVALUATION OF PROJECT/DISSERTATION WORK

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

i. A Project Review Committee (PRC) shall be constituted with Head of the Department and two other senior faculty members in the department.

ii. Registration of Dissertation/Project Work: A candidate is permitted to register for the project work after satisfying the attendance requirement of all the subjects, both theory and practical.

iii. After satisfying (ii), a candidate has to submit, in consultation with his project supervisor, the title, objective and plan of action of his project work for approval. The student can initiate the Project work, only after obtaining the approval from the Project Review Committee (PRC).

iv. If a candidate wishes to change his supervisor or topic of the project, he can do so with the approval of the Project Review Committee (PRC). However, the PRC shall examine whether or not the change of topic/supervisor leads to a major change of his initial plans of project proposal. If yes, his date of registration for the project work starts from the date of change of Supervisor or topic as the case may be.

v. Continuous assessment of Dissertation-I and Dissertation-II during the Semester(s) will be monitored by the PRC.

vi. A candidate shall submit his status report in two stages to the PRC, at least with a gap of 3 months between them.

vii. The work on the project shall be initiated at the beginning of the 3rd Semester and the duration of the project is two semesters. A candidate is permitted to submit Project Thesis only after successful completion of theory and practical course with the approval of PRC not earlier than 40 weeks from the date of registration of the project work. The candidate has to pass all the theory and practical subjects before submission of the Thesis.

viii. Three copies of the Project Thesis certified by the supervisor shall be submitted to the College.

ix. The thesis shall be adjudicated by one examiner from the approved panel of examiners, by the COE.

x. Viva-Voce examination shall be conducted by a board consisting of the Supervisor, Head of the Department and the examiner who adjudicated the Thesis. The Head of the Department shall coordinate and make arrangements for the conduct of Viva-Voce examination. The Board shall jointly report the candidate's work as one of the following:

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

If the report of the Viva-Voce is unsatisfactory, the candidate shall retake the Viva-Voce examination only after three months. If he fails to get a satisfactory report at the second Viva-Voce examination, the candidate has to re-register for the project and complete the project within the stipulated time after taking the approval from the Concern authorities.

9. GRADING SYSTEM:

9.1 Computation of SGPA

The following procedure is to be adopted to compute the Semester Grade Point Average (SGPA) and Cumulative Grade Point Average (CGPA):

The SGPA is the ratio of sum of the product of the number of credits with the grade points scored by a student in all the courses taken by a student and the sum of the number of credits of all the courses undergone by a student, i.e.,

$$SGPA\ (Si) = \sum (Ci \times Gi) / \sum Ci$$

Where C_i is the number of credits of the i^{th} course and G_i is the grade point scored by the student in the i^{th} course.

9.2 Computation of CGPA

The CGPA is also calculated in the same manner taking into account all the courses undergone by a student over all the semester of a programme, i.e.,

$$CGPA = \sum (Ci \times Si) / \sum Ci$$

Where Si is the SGPA of the it semester and Ci is the total number of credits in that semester. The SGPA and CGPA shall be rounded off to TWO decimal points and reported in the transcripts.

9.3 Award of Grade in Each Semester:

a. Based on the performance during a given semester, a final letter grade will be awarded at the end of the semester for each subject. The letter grades and the corresponding grade points are as given in the Table.

Marks Range (Max–100)	Level	Letter Grade	Grade Point
≥90	Outstanding	A+	10
≥80 to <90	Excellent	A	9
≥70to<80	Very Good	B	8
≥60to<70	Good	C	7
≥50to<60	Satisfactory	D	6
<50	Fail	F	0
-	Absent	AB	0

b. Grade Sheet: A grade sheet (memorandum) will be issued to each student indicating his performance in all courses taken in that semester and also indicating the Grades.

c. Transcripts: After successful completion of the total program of study, a Transcript containing performance of all academic years will be issued as a final record. Duplicate transcripts will also be issued up to any point of study to any student on request and by paying the stipulated fee in force.

d. Candidates shall be permitted to apply for revaluation within the stipulated period with payment of prescribed fee.

10. AWARD OF DEGREE AND CLASS

After a student has satisfied the requirements prescribed for the completion of the program and is eligible for the award of M.Tech Degree he shall be placed in one of the following four classes:

Class Awarded	CGPA to be secured	
First Class with Distinction	≥7.75 (Without any supplementary appearance)	**From the CGPA secured from 68 Credits.**
First Class	≥7.75(With any supplementary appearance) ≥6.75to<7.75	
Second Class	≥6.0to< 6.75	
Pass Class	≥5.0to< 6.0	

11. CONDUCT AND DISCIPLINE:

Students admitted in SCET are to be followed the conduct and discipline of the college and which will be updated from time to time.

12. MALPRACTICES:

If any malpractices held in internal assessment tests or Semester-End Examinations, Principal constitute a Malpractice Enquiry Committee to enquire the case. The principal shall take necessary action based on the recommendations of the committee as per stipulated norms.

13. WITHHOLDING OF RESULTS

If the student has not paid the dues, if any, to the university or if any case of indiscipline is pending against him, the result of the student will be withheld. His degree will be withheld in such cases.

14. GENERAL

- Wherever the words “he”, “him”, “his”, occur in the regulations, they include “she”, “her”, “hers”.
- The academic regulation should be read as a whole for the purpose of any interpretation.
- In the case of any doubt or ambiguity in the interpretation of the above rules, the decision of the Chairman, Academic Council is final.
- The College may change or amend the academic regulations or syllabi at any time and the changes or amendments made shall be applicable to all the students with effect from the dates notified by the College.

STRUCTURAL ENGINEERING
COURSE STRUCTURE – PG

SEMESTER-I

S.No.	Course Code	Course Title	L	T	P	C	I	E	TM
1	24SE1T01	Theory of Elasticity	3	0	0	3	40	60	100
2	24SE1T02	Structural Dynamics	3	0	0	3	40	60	100
3		**ELECTIVE – I**	3	0	0	3	40	60	100
	24SE1E01	Stability of Structures							
	24SE1E02	Earth retaining Structures							
	24SE1E03	Construction Technology and Management							
4		**ELECTIVE – II**	3	0	0	3	40	60	100
	24SE1E04	Sub Structure Design							
	24SE1E05	Structural Optimization							
	24SE1E06	Matrix Analysis of Structures							
5	24SE1L01	Structural Design Lab	0	0	2	2	40	60	100
6	24SE1L02	Advanced Concrete Lab	0	0	2	2	40	60	100
7	24CC1T01	Research Methodology and IPR	2	0	0	2	40	60	100
8		Audit Course-I	2	0	0	0	-	-	-
Total			**16**	**0**	**4**	**18**	**280**	**420**	**700**

SEMESTER-II

S.No.	Course Code	Course Title	L	T	P	C	I	E	TM
1	24SE2T 01	Finite Element Method	3	0	0	3	40	60	100
2	24SE2T02	Theory of Plates and Shells	3	0	0	3	40	60	100
3		**ELECTIVE – III**	3	0	0	3	40	60	100
	24SE2E07	Retrofitting and Rehabilitation of Structures							
	24SE2E08	Bridge Engineering							
	24SE2E09	Analysis and Design of Tall Buildings							
4		**ELECTIVE – IV**	3	0	0	3	40	60	100
	24SE2E10	Earthquake Resistant Design							
	24SE2E11	Plastic Analysis and Design							
	24SE2E12	Industrial Structures							
5	24SE2L01	Advanced Structural Engineering Lab	0	0	2	2	40	60	100
6	24SE2L02	CAD Laboratory	0	0	2	2	40	60	100
7	24SE2P01	Mini Project with Seminar	0	0	4	2	50	--	50
8		Audit Course-II	2	0	0	0	--	--	--
Total			**14**	**0**	**8**	**18**	**290**	**360**	**650**

SEMESTER-III

S.No.	Course Code	Course Title	L	T	P	C	I	E	TM
1		**ELECTIVE – V**	3	0	0	3	40	60	100
	24SE3E13	Analytical and Numerical Methods in Structural Engineering							
	24SE3E14	Pre stressed Concrete							
	24SE3E15	Structural Health Monitoring							
2		**OPEN ELECTIVE**	3	0	0	3	40	60	100
	24CM3O01	Business Analytics							
	24CC3O02	Industrial Safety							
	24CC3O03	Operations Research							
	24MB3O04	Cost Management of Engineering Projects							
	24CC3O05	Composite Materials							
	24PE3O06	Waste to Energy							
3		Project Phase – I	0	0	20	10	-	-	-
Total			**6**	**0**	**20**	**16**	**80**	**120**	**200**

SEMESTER-IV

S.No.	Course Code	Course Title	L	T	P	C	I	E	TM
1	24SE4P01	Project Phase – II	0	0	32	16	80	120	200
Total			**0**	**0**	**32**	**16**	**80**	**120**	**200**

Audit Course 1 & 2		
S.No	**Subject Code**	**Subject**
1	24ACXM01	English for Research Paper Writing
2	24ACXM02	Disaster Management
3	24ACXM03	Sanskrit for Technical Knowledge
4	24ACXM04	Value Education
5	24ACXM05	Constitution of India
6	24ACXM06	Pedagogy Studies
7	24ACXM07	Stress Management by yoga
8	24ACXM08	Personality Development Through Life Enlightenment Skills

M.Tech I SEMESTER	L	T	P	C
	3	-	-	3
24SE1T01 :: THEORY OF ELASTICITY				

Course Objectives:

1. To know various notations for stress and strain in two and three dimensional State of stress
2. To understand behaviour of a member in two and three dimensional state of stress.
3. To develop formulations for solving problems on elasticity.

Course Outcomes:

Upon the successful completion of this course, the students will be able to:

CO1: Apply the conditions of compatibility and equations of equilibrium **(K3)**
CO2: Derive the stresses and strains in rectangular co-ordinate system **(K3)**
CO3: Obtain the stresses and strains in polar co-ordinate system **(K3)**
CO4: Determine the stresses and strains in three dimensional state of stress **(K3)**
CO5: Solve torsional problems by energy method **(K3)**

Syllabus:

UNIT-I

Elasticity – Notation for forces and stresses – components of stresses and strains – Hooke's Law - Plane Stress – Plane strain – Differential Equations of equilibrium – Boundary conditions – Compatibility equations - Stress function – Boundary Conditions.

UNIT -II

Two dimensional problems in rectangular co-ordinates – Solution by polynomials – Saint Venant's principle – Determination of displacements – Bending of simple beams – Application of Fourier series for two dimensional problems for gravity loading

UNIT-III

Two dimensional problems in polar co-ordinates - General equations in polar co-ordinates –
Stress distribution for problems having symmetrical about an axis - Strain components in polar co-ordinates – Displacements for symmetrical stress distributions - Stresses for plates with circular holes subjected to far field tension – stress concentration factor.

UNIT-IV

Analysis of stress and strain in three dimension - Principal stresses – Stress ellipsoid and stress director surface – Determination of principal stresses - Maximum shear stress – Homogeneous Deformation – General Theorems - Differential equations of equilibrium – Conditions of compatibility – Equations of equilibrium in terms of displacements – Principle of superposition – Uniqueness of solution –Reciprocal theorem.

UNIT-V

Torsion of prismatical bars – Bars with elliptical cross section – Other elementary solution –Membrane analogy – Torsion of rectangular bars – Solution of torsional problems by energy method.

Text Books:

1. Theory of Elasticity- Stephen Timoshenko & J. N. Goodier, Mc.Grawhill Publishers
2. Advanced Mechanics of Solids L.S. Srinath, McGraw Hill Publishers

Reference Books:

1. Elasticity: Theory, Applications and Numeric- Martin H. Sadd, Wiley Publishers
2. Theory of Elasticity -Sadhu Singh 3rd Edition, Khanna Publishers

M.Tech I SEMESTER	L	T	P	C
	3	-	-	3
24SE1T02 :: STRUCTURAL DYNAMICS				

Course Objectives:

1. To find the behavior of structures subjected to dynamic loads such as wind, earthquake and blast loads.
2. To study the different Dynamic analysis procedures for calculating the response of structures.

Course Outcomes:

Upon the successful completion of this course, the students will be able to:

CO1: Understand the response of structural systems to dynamic loads **(K2)**

CO2: Know the behavior of structures subjected to dynamic loads under free vibration and Harmonic excitation **(K3)**

CO3: Derive expressions for response of linear and nonlinear SDOF structures with various dynamic loading **(K3)**

CO4: Obtain expression for response of MDOF structures with various Dynamic loading. **(K3)**

CO5: Possess the ability to find out suitable solution for continuous system **(K3)**

Syllabus:

UNIT-I

Introduction to Structural Dynamics: Fundamental objective of Dynamic analysis – Types of prescribed loadings – methods of Discretization – Formulation of the Equations of Motion.

UNIT-II

Theory of Vibrations: Introduction – Elements of a Vibratory system – Degrees of Freedom of continuous systems - Oscillatory motion – Simple Harmonic Motion – Free Vibrations of Single Degree of Freedom (SDOF) systems – Undamped and Damped – Critical damping – Logarithmic decrement – Forced vibrations of SDOF systems – Harmonic excitation – Dynamic magnification factor – Band width.

UNIT-III

Single Degree of Freedom System: Formulation and Solution of the equation of Motion – Free vibration response – Response to Harmonic, Periodic, Impulsive and general dynamic loadings – Duhamel integral.

UNIT-IV

Multi Degree of Freedom System: Selection of the Degrees of Freedom – Evaluation of Structural Property Matrices – Formulation of the MDOF equations of motion - Undamped free vibrations – Solution of Eigen value problem for natural frequencies and mode shapes – Analysis of dynamic response - Normal coordinates.

UNIT-V

Continuous Systems: Introduction – Flexural vibrations of beams – Elementary case – Equation of motion – Analysis of undamped free vibration of beams in flexure – Natural frequencies and mode shapes of simple beams with different end conditions.

Text Books:

1. Structural Dynamics Anil K Chopra, 4edition, Prentice Hall Publishers
2. Structural Dynamics Theory & Computation – Mario Paz, CBS Publishes and Distributors
3. Elementary Structural Dynamics- V.K. ManikaSelvam, Dhanpat Rai Publishers

Reference Books:

1. Dynamics of Structures by Clough & Penzien 3e, Computers & Structures Inc.
2. Theory of Vibration -William T Thomson, Springer Science.
3. Mechanical Vibrations- S. S. Rao, 5e, Pearson Publications.
4. Structural Dynamics of Earthquake Engineering - Theory and Application using Mathematica and Matlab- S. Rajasekharan.

M.Tech I SEMESTER	L	T	P	C
	3	-	-	3
24SE1E01 :: STABILITY OF STRUCTURES				

Course Objectives:

1. To Analyze behaviour of beam-columns subjected to various types of loads
2. To Know and understand various methodologies of elastic and inelastic buckling of columns
3. To Know the concepts of lateral buckling of beams and torsional buckling of circular Sections.

Course Outcomes:

Upon the successful completion of this course, the students will be able to:

CO1: know different types of structural instabilities **(K3)**
CO2: Execute and work out the inelastic buckling using various methodologies. **(K3)**
CO3: Examine the behavior of beam columns and frames with and without side sway using classical and stiffness methods **(K3)**
CO4: Flexural torsional buckling of various beams and non- circular sections. **(K4)**
CO5: analyze the concepts of Lateral Buckling of simply supported Beams **(K4)**

Syllabus:

UNIT-I

Beam columns: Differential equation for beam columns – Beams column with concentrated loads – continuous lateral load – couples – Beam column with built in ends – continuous beams with axial load – application of Trigonometric series – Determination of allowable stresses.

UNIT-II

Elastic buckling of bars: Elastic buckling of straight columns – Effect of shear stress on buckling – Eccentrically and laterally loaded columns –Sway & Non Sway mode – Energy methods – Buckling of a bar on elastic foundation – Buckling of bar with intermediate compressive forces and distributed axial loads – Buckling of bars with change in cross section – Effect of shear force on critical load – Built up columns – Effect of Initial curvature on bars – Buckling of frames – Sway & Non Sway mode.

UNIT-III

In-elastic buckling: Buckling of straight bars – Double modulus theory Tangent modulus theory. Experiments and design formulae: Experiments on columns – Critical stress diagram – Empirical formulae of design – various end conditions – Design of columns based on buckling. Mathematical Treatment of stability problems: Buckling problem orthogonality relation – Ritz method –Stiffness method and formulation of Geometric stiffness matrix- Applications to simple frames.

UNIT-IV

Torsional Buckling: Pure torsion of thin walled bars of open cross section – Non uniform torsion of thin walled bars of open cross section - Torsional buckling – Buckling of Torsion and Flexure.

UNIT-V

Lateral Buckling of simply supported Beams: Beams of rectangular cross section subjected for pure bending, Buckling of I Section subjected to pure bending.

Text Books:

1. Principles of Structural Stability Theory by Alexander Chajes, Prentice-Hall, Inc, Engle wood Cliffs, New Jersey.
2. Structural Stability Theory and Implementation by W.F.Chen and E.M.Lui, Elsevier science Publishing Co., Inc, New York.

3. Theory of Elastic Stability by S. P. Timshenko & J.M. Gere- Mc Graw Hill Publications.

Reference Books:

1. Fundamentals of Structural Stability by George J Smith & Dewey H. Hodges, Elsevier Publications .
2. Elastic Stability of Structural Elements, N.G.R. Iyengar Macmillan Publications Theory of Elastic Stability by Manikaselvam.

M.Tech I SEMESTER	L	T	P	C
	3	-	-	3
24SE1E02 :: EARTH RETAINING STRUCTURES				

Course Objective:

1. To develop fundamental understanding of science and engineering of earth retaining structures, through rigorous theoretical discussions, designs and live examples.

Course Outcomes:

Upon the successful completion of this course, the students will be able to:

CO1: Solve for earth pressure exerted by soil on retaining walls using earth pressure theories. **(K3)**
CO2: Analyze the stability of conventional retaining walls. **(K4)**
CO3: Analyze the stability of sheet pile walls **(K4)**
CO4: Design reinforced soil wall using the concept of reinforced soil. **(K4)**
CO5: Design various components of braced cuts and coffer dams. **(K4)**

Syllabus:

UNIT-I

Earth pressures – Different types and their coefficients- Classical Theories of Earth pressure – Rankine's and Coulomb's Theories for Active and Passive earth pressure- Computation of Lateral Earth Pressure in Homogeneous and Layered soils- Graphical solutions for Coulomb's Theory in active and passive conditions.

UNIT-II

Retaining walls – different types - Type of Failures of Retaining Walls – Stability requirements – Drainage behind Retaining walls – Provision of Joints – Relief Shells.

UNIT-III

Sheet Pile Structures – Types of Sheet piles – Cantilever sheet piles in sands and clays – Anchored sheet piles – Free earth and Fixed earth support methods – Row's moment reduction method – Location of anchors, Forces in anchors.

UNIT-IV

Soil reinforcement – Reinforced earth - Different components – their functions – Mechanics of reinforced earth – Failure modes-Failure theories – Design of Embakments on problematic soils.

UNIT-V

Braced cuts and Cofferdams: Lateral Pressure in Braced cuts – Design of Various Components of a Braced cut – Stability of Braced cuts – Bottom Heave in cuts. – types of cofferdam, suitability, merits and demerits – Design of single – wall cofferdams and their stability aspects
– TVA method and Cummins' methods.

Text Books:

1. Principles of Foundation Engineering 7e by Braja Das, Cengage Learning
2. Foundation analysis and design by Bowles, J.E. – McGraw Hill
3. An Introduction to Soil Reinforcement and Geosynthetics by G L Sivakumar Babu University Press.

Reference Books:

1. Soil Mechanics in Engineering Practice – Terzaghi, K and Ralph, B. Peck 2e John Wiley & Sons.
2. Analysis and Design of Foundations and Retaining Structures, Samsher Prakash, Gopal Ranjan and Swami Saran, Saritha Prakashan, New Delhi
3. NPTEL course materials on Geo-synthetics and Earth Retaining Structures

M.Tech	L	T	P	C
I SEMESTER	3	-	-	3
24SE1E03: CONSTRUCTION TECHNOLOGY AND MANAGEMENT				

Course Objectives:

1. To introduce to the student, the concept of project management including network drawing and monitoring
2. To introduce the various equipment related to construction like earth moving equipment, trucks and handling equipment, aggregate production and construction equipment and machinery.
3. To introduce the importance of safety in construction projects

Course Outcomes:

Upon the successful completion of this course, the students will be able to:

CO1: Explain the importance of construction planning **(K2)**
CO2: Understand the Project evaluation and review techniques **(K2)**
CO3: Give the functioning of various earth moving equipment. **(K2)**
CO4: Describe about concreting equipment **(K2)**
CO5: Explain construction methods like earthwork, piling etc. **(K2)**

Syllabus:

UNIT- I

Construction project management and its relevance - qualities of a project manager – project planning - coordination - scheduling - monitoring - bar charts - milestone charts.

UNIT -II

Project evaluation and review technique - critical path method-cost analysis - updating - crashing for optimum cost -crashing for optimum resources - allocation of resources.

UNIT- III

Construction equipment - economical considerations - earthwork equipment - Trucks and handling equipment - rear dump trucks - capacities of trucks. and handling equipment - calculation of truck production – compaction equipment - types of compaction rollers.

UNIT -IV

Hoisting and earthwork equipment - hoists - cranes - tractors - bulldozers - graders – scrapers draglinesclamshell buckets. Concreting equipment – crushers - jaw crushers - gyratory crushers - impact crushers- selection of crushing equipment - screening of aggregate- concrete mixers- mixing, consolidating and finishing.

UNIT -V

Construction methods-earthwork-piling- placing of concrete - form work - fabrication and erection- quality control and safety engineering.

Text Books:

1. 'Construction Planning , Equipment and Methods' by Peurifoy and Schexnayder , Shapira, Tata Mcgrawhill
2. 'Construction Project Management Theory and Practice' by Kumar NeerajJha (2011), Pearson.
3. 'Construction Technology' by Subir K. Sarkar and SubhajitSaraswati, Oxford University press

Reference Books:

1. 'Construction Project Management - An Integrated Approach' by Peter Fewings , Taylor and Francis
2. 'Construction Management Emerging Trends and Technologies' by Trefor Williams , Cengage learning.

M.Tech I SEMESTER	L	T	P	C
	3	-	-	3
24SE1E04 :: SUB-STRUCTURE DESIGN				

Course Objectives:

1. To assess the soil condition at a given location in order to suggest suitable foundation based upon bearing capacity.
2. To familiarize with the design of pile foundation and pile caps.

Course Outcomes:

Upon the successful completion of this course, the students will be able to:

CO1: plan soil investigation and calculate the stresses on soil due to applied loads. **(K2)**
CO2: Know methods of soil sampling and preservation. **(K2)**
CO3: calculate bearing capacity of soil to design shallow foundations. **(K3)**
CO4: Select suitable type of shallow foundation based on the available soil category. **(K4)**
CO5: Select suitable type of pile foundation for different soil stratum and in evaluation of group capacity by formulation. **(K4)**

Syllabus:

UNIT-I

Soil Exploration – Importance, Terminology, planning - Geophysical methods. Borings, location, spacing and depth, methods of boring including drilling, stabilization of boreholes, boring records.

UNIT-II

Soil sampling – Methods of sampling -Types of samples and samplers-cleaning of bore holes, preservation, labeling and shipment of samples - Design considerations of open drive samplers.

UNIT-III

Shallow Foundations –Bearing capacity – General bearing capacity equation, Meyerhof's, Hansen's and Vesic's bearing capacity factors - Bearing capacity of stratified soils – Bearing capacity based on penetration resistance- safe bearing capacity and allowable bearing pressure.
(Ref: IS -2131 & IS 6403)

UNIT-IV

Types and choice of type. Design considerations including location and depth, Proportioning of shallow foundations- isolated and combined footings and mats - Design procedure for mats. Floating foundation-Fundamentals of beams on Elastic foundations.(Ref: IS -456 & N.B.C. relevant volume).

UNIT-V

Pile foundations-Classification of piles-factors influencing choice-Load -carrying capacity of single piles in clays and sands using static pile formulae- á - â - and λ - methods –Dynamic pile formulae-limitations-Monotonic and cyclic pile load tests – Under reamed piles. Pile groups -Efficiency of pile groups- Different formulae-load carrying capacity of pile groups in clays and sands – settlement of pile groups in clays and sands – Computation of load on each pile in a group.

Text Books:

1. Principles of Foundation Engineering by Braja M. Das.
2. Soil Mechanics in Engineering Practice by Terzagi and Peck

Reference Books:

1. Foundation Design by Wayne C. Teng, John Wiley & Co.,
2. Foundation Analysis and Design by J.E. Bowles McGraw Hill Publishing Co.,

3. Analysis and Design of sub structures by Swami Saran
4. Design Aids in Soil Mechanics and Foundation Engineering by Shanbaga R. Kaniraj,Tata Mc. Graw Hill.
5. Foundation Design and Construction by MJ Tomlinson – Longman Scientific
6. A short course in Foundation Engineering by Simmons and Menzes – ELBS.

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	3	-	-	3
24SE1E05 :: STRUCTURAL OPTMIZATION				

Course Objectives:

1. To familiarize the student on various methods of optimization and design of structural members.
2. To familiarize the student on classical optimization techniques, Non-Liner programming and Linear programming

Course Outcomes:

Upon the successful completion of this course, the students will be able to:

CO1: Classify optimization problems and function behavior. **(K2)**
CO2: Gain the knowledge on classical optimization techniques. **(K3)**
CO3: Obtain the knowledge on non-linear programming methods**. (K3)**
CO4: Know Plastic analysis and Minimum weight design and rigid frame using linear programming**.(K3)**
CO5: Design of beams and frames using dynamic programming technique. **(K4)**

Syllabus:

UNIT-I

Introduction: Need and scope for optimization – statements of optimization problems Objective function and its surface design variables- constraints and constraint surface Classification of optimization problems (various functions continuous, discontinuous and discrete) and function behavior (monotonic and unimodal).

UNIT-II

Classical optimization techniques: Differential calculus method, multi variable optimization by method of constrained variation and Lagrange multipliers (generalized problem) Khun-Tucker conditions of optimality -Fully stressed design and optimality criterion based algorithms introduction, characteristics of fully stressed design theoretical basis-examples.

UNIT-III

Non-Liner programming: Unconstrained minimization- Fibonacci, golden search, Quadratic and cubic interpolation methods for a one dimensional minimization and univariate method, Powel's method, Newton's method and Davidon Fletcher Powell's method for multivariable optimization- Constrained minimization- Cutting plane method- Zoutendjik's method- penalty
function methods.

UNIT-IV

Linear programming: Definitions and theorems- Simplex method-Duality in Linear programming- Plastic analysis and Minimum weight design and rigid frame.

UNIT-V

Introduction to quadratic programming: Geometric programming- and dynamic programming-Design of beams and frames using dynamic programming technique.

Text Books:

1. "Optimization Theory and Applications" by Rao, S.S., Wiley Eastern Ltd., New Delhi, 1978.
2. "Optimum Design of Structures" by Majid, K.I., Newnes-Butter Worths, London, 1974.
3. Optimization Concepts and Application in Engineering- Belegundu A.D. and Chandrupatla

Reference Books:

1. "Mathematical Foundations for Design: Civil Engg. Systems" by Robert, M. Stark and Robert L. Nicholls, McGraw Hill Book Company, New York, 1972.
2. "Optimum Structural Design, Theory and Applications", Edited by Gallegher, R.H. and Zienkiewiez, O.C., John Wiley and Sons, New York, 1973.

M.Tech I SEMESTER	L	T	P	C
	3	-	-	3
24SE1E06 :: MATRIX ANALYSIS OF STRUCTURES				

Course Objectives:

1. To prepare the students to have a basic knowledge in the matrix methods such as flexible matrix method and Stiffness matrix method.
2. To prepare the students to analyze the Plane frame and Plane truss problems by matrix methods.

Course Outcomes:

Upon the successful completion of this course, the students will be able to:

CO1: Perform the structural analysis of determinate and indeterminate structures using classical compatibility methods, such as method of consistent displacements, force and equilibrium Methods **(K3)**

CO2: Use stiffness method for analyzing the beams and trusses in structural analysis. **(K3)**

CO3: Solve multiple degree of freedom two and three dimensional problems involving trusses, beams, frames and plane stress **(K3)**

CO4: Understand basic finite element analysis **(K2)**

CO5: Calculate member stiffness for space trusses and frames **(K3)**

Syllabus:

UNIT-I

Introduction of matrix methods of analysis – Static and kinematic indeterminacy – Degree of freedom – Structure idealization-stiffness and flexibility methods – Suitability: Element stiffness matrix for truss element, beam element and Torsional element- Element force - displacement equations.

UNIT-II

Stiffness method – Element and global stiffness equation – coordinate transformation and global assembly – structure stiffness matrix equation – analysis of simple pin jointed trusses – continuous beams – rigid jointed plane frames.

UNIT-III

Stiffness method for Grid elements – development of stiffness matrix – coordinates transformation. Examples of grid problems – tapered and curved beams.

UNIT-IV

Additional topics in stiffness methods – discussion of band width – semi band width – static condensation – sub structuring –Loads between joints-Support displacements- inertial and thermal stresses-Beams on elastic foundation by stiffness method.

UNIT-V

Space trusses and frames - Member stiffness for space truss and space frame– Transformation matrix from Local to Global – Analysis of simple trusses, beams and frames.

Text Books:

1. Matrix analysis of structures, Robert E Sennet- Prentice Hall- Englewood cliffs- New Jercy
2. Advanced structural analysis, P. Dayaratnam-Tata McGraw hill publishing company limited.
3. Structural Analysis Matrix Approach - Pandit and Gupta, McGraw Hil Education

Reference Books:

1. Indeterminate Structural analysis, C K Wang, Amazon Publications

2. Matrix Analysis of Framed Structures 3e-William Weaver, Jr, James M. Gere, VanNostr and Reinhold, Newyork.
3. Foundation Analysis and design, J.E. Bowls, 5e, Amazon Publications.

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	-	-	2	2
24SE1L01 :: STRUCTURAL DESIGN LAB				

Course Outcomes:

Upon the successful completion of this course, the students will be able to:

CO1: Design and Detail all the Structural Components of Frame Buildings. **(K4)**

CO2: Design and Detail complete Multi-Storey Frame Buildings**. (K4)**

Syllabus:

Design and detailed drawing of complete G + 3 structures by individual student using latest relevant IS codes.

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	-	-	2	2
24SE1L02 :: ADVANCED CONCRETE LAB				

Course Objectives:

1. To familiarize the students with physical properties and mechanical behaviour of concrete and related construction materials.
2. To demonstrate the students background theoretical aspects related to concrete making materials and to highlight the link with actual practice.

Course Outcomes:

Upon the successful completion of this course, the students will be able to:

CO1: Study various laboratory tests on Cement and Aggregates **(K2)**
CO2: Design different concrete grades and study the parameters affecting its performance **(K3)**
CO3: Conduct Non- Destructive testing of concrete **(K3)**
CO4: perform tests on Self compaction concrete **(K4)**

List of Experiments:

1. Study of the effect of water cement ratio on workability and strength of Concrete.
2. Study of the effect of aggregate cement ratio on Workability and strength of concrete.
3. Study on properties of cement and aggregate for Mix design.
4. Mix design methods using
    a. I.S. Code method.
    b. ACI Code method.
5. Study of Non-Destructive Testing Methods on Concrete.
6. Qualifications tests on Self compaction concrete using L Box test, J Box test, U box test, Slump test.

Text Books:

1. Properties of Concrete by A. M. Neville, ELBS publications
2. Design of Concrete Mixes by N. Krishna Raju, CBS Publications, 2000.

Reference Book:

1. Concrete Technology by M.S. Shetty, S.Chand & Co

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	2	-	-	2
24CC1T01 :: RESEARCH METHODOLOGY & IPR				

Course Objectives:

1. To impart knowledge on the basic research process.
2. To provide knowledge on the different types of research.
3. To educate the students on report writing.

Course Outcomes:

Upon the successful completion of this course, the students will be able to:

CO1: Understand research problem formulation. **(K2)**

CO2: Analyse research related information and research ethics **(K2)**

CO3: Summarise the present day scenario controlled and monitored by Computer and Information Technology, where the future world will be ruled by dynamic ideas, concept, creativity and innovation**.(K2)**

CO4: Explain how IPR would take such important place in growth of individuals & nation, to summarise the need of information about Intellectual Property Right to be promoted among student community in general & engineering in particular. **(K2)**

CO5: Relate that IPR protection provides an incentive to inventors for further research work and investment in R&D, which leads to creation of new and better products, and in turn brings about economic growth and social benefits**.(K3)**

Syllabus:

UNIT-I

Meaning of research problem, Sources of research problem, Criteria Characteristics of a good research problem, Errors in selecting a research problem, Scope and objectives of research problem.

UNIT-II

Approaches of investigation of solutions for research problem, data collection, analysis, interpretation, Necessary instrumentations.

UNIT-III

Effective literature studies approaches, analysis Plagiarism, Research ethics, Effective technical writing, how to write report, Paper Developing a Research Proposal, Format of research proposal, a presentation and assessment by a review committee.

UNIT-IV

Nature of Intellectual Property: Patents, Designs, Trade and Copyright. Process of Patenting and Development: technological research, innovation, patenting, development. International Scenario: International cooperation on Intellectual Property. Procedure for grants of patents, Patenting under PCT.

UNIT-V

Patent Rights: Scope of Patent Rights. Licensing and transfer of technology. Patent information and databases. Geographical Indications. New Developments in IPR: Administration of Patent System. New developments in IPR; IPR of Biological Systems, Computer Software etc. Traditional knowledge Case Studies, IPR and IITs.

Text Books:

1. Research methodology: Methods and Techniques, C.R. Kothari, GauravGarg, New Age International, 4th Edition,2018.

2. Research Methodology a step-by-step guide for beginners, Ranjit Kumar, SAGE Publications Ltd.,3rd Edition, 2011.
3. Ranjit Kumar, "Research Methodology – A Step by Step for Beginner's", 2nd Edition, Pearson, Education, 2016.
4. Ramappa,T., "Intellectual Property Rights Under WTO", 2nd Edition, S Chand, 2015.

Reference Books:

1. KVS Sharma, "Statistics made simple, Do it yourself", 2nd Edition (Reprint), Prentice Hall, 2010.
2. Mark Saunders, Philip Levis, AdrainThornbill, "Research Methods for Business Students", 3rd Edition (Reprint), Pearson Education, 2013.
3. Study Material, Professional Programme Intellectual Property Rights, Law and Practice, The Institute of Company Secretaries of India, Statutory Body under an Act of Parliament, September2013.

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24SE2T01 :: FINITE ELEMENT METHOD				

Course Objective:

1. To apply the concepts of Finite element method for solving structural Engineering problems.

Course Outcomes:

Upon the successful completion of this course, the students will be able to:

CO1: Understand the fundamentals of Finite element method. **(K2)**
CO2: Derive the solution of the truss elements by Finite element method. **(K3)**
CO3: Formulate the solution of beam elements by Finite element method. **(K3)**
CO4: analyze plain stress, plain strain, axi-symmetric and plate bending problems by Finite element method**. (K4)**
CO5: apply the concept of iso-parametric formulation for solving problems. **(K3)**

Syllabus:

UNIT-I

Introduction: Review of stiffness method- Principle of Stationary potential energy-Potential energy of an elastic body- Rayleigh-Ritz method of functional approximation – variational approaches -weighted residual methods.

UNIT-II

Finite Element formulation of truss element: Stiffness matrix- properties of stiffness matrix – Selection of approximate displacement functions-solution of a plane truss- transformation matrix and stiffness matrix for a 3-D truss- Inclined and skewed supports- Galerkin's method for 1-D truss – Computation of stress in a truss element.

UNIT-III

Finite element formulation of Beam elements: Beam stiffness-assemblage of beam stiffness matrix-Examples of beam analysis for concentrated and distributed loading- Galerkin's method - 2-D Arbitrarily oriented beam element – inclined and skewed supports – rigid plane frame examples.

UNIT-IV

Finite element formulation for plane stress, plane strain and axisymmetric problems- Derivation of CST and LST stiffness matrix and equations-treatment of body and surface forces-Finite Element solution for plane stress and axisymmetric problems- comparison of CST and LST elements –convergence of solution- interpretation of stresses.

UNIT-V

Iso-parametric Formulation: An isoparametric bar element- plane bilinear isoparametric element – quadratic plane element - shape functions, evaluation of stiffness matrix, consistent nodal load vector - Gauss quadrature- appropriate order of quadrature – element and mesh instabilities – spurious zero energy modes, stress computation- patch test.

Text Books:

1. Finite Element Analysis by Sk. Md Jalaludin , Anuradha Publishers.
2. A first course in the Finite Element Method – Daryl L. Logan, Thomson Publications.
3. Concepts and applications of Finite Element Analysis – Robert D. Cook, Michael E Plesha, John Wiley & Sons Publications
4. Fundamental Finite Element Analysis and Applications: with Mathematica and Matlab Computations, Bhatti, M.A. Wiley Publications

Reference Books:

1. Introduction to Finite Elements in Engineering-Tirupati R. Chandrupatla, Ashok D. Belgunda, PHI publications.
2. Finite Element Methods (For Structural Engineers) Wail N Rifaie, Ashok K Govil, New Age International (P) Limited.
3. Finite Element Analysis –Theory & Programming by C.S.Krishna Murthy- Tata Mc graw Hill, New Delhi.
4. Finite Element Analysis by S.S. Bhavakatti -New age international publishers.
5. Finite Element Analysis by David V Hutton, Tata Mc graw Hill, New Delhi.

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24SE2T02 :: THEORY OF PLATES AND SHELLS				

Course Objectives:

1. To familiarize with the concepts of plates and shells and designing of shells.
2. To have a knowledge about various plate theories due to bending

Course Outcomes:

Upon the successful completion of this course, the students will be able to:

CO1: Gain the knowledge of thin plates using various approaches. **(K3)**
CO2: Analyse the thin plates subjected to different loading and boundary conditions**. (K4)**
CO3: Know different types of shells subjected to different loading criterion and boundary conditions. **(K3)**
CO4: Design short and long cylindrical shells using bending theory **(K4)**
CO5: Use membrane theory for analysis and design of cylindrical shells **(K3)**

Syllabus:

UNIT-I

Derivation of governing differential equation for plate– in plane bending and transverse bending effects- Rectangular plates: Plates under various loading conditions like concentrated, uniformly distributed load and hydrostatic pressure. Navier and Levy's type of solutions for various boundary condition.

UNIT-II

Circular plates: Symmetrically loaded, circular plates under various loading conditions, Annular plates.

UNIT-III

Introduction to Shells- Single and double curvature- Equations of Equilibrium of Shells: Derivation of stress resultants, Principles of membrane theory and bending theory.

UNIT-IV

Cylindrical Shells: Derivation of the governing DKJ equation for bending theory, details of Schorer's theory. Application to the analysis and design of short and long shells. Use of ASCE Manual coefficients for the design.

UNIT-V

Beam theory of cylindrical shells: Beam and arch action. Design of diaphragms – Geometry analysis and design of elliptic Paraboloid, Conoidal and Hyperbolic Paraboloid shapes by membrane theory.

Text Books:

1. Theory of plates and shells by S.P. Timoshenko and S. Woinowsky -Krieger, McGraw-Hill
2. N. K. Bairagi, "Shell Analysis" , Khanna Publishers.

Reference Books:

1. R. Szilard, "Theory & Analysis of Plate - Classical & Numerical Methods" ,John Wiley & Sons Publishing Company.
2. Ramaswamy, G. S., "Design & Construction of Concrete ShellRoofs", McGraw-Hill Publishing Company.

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	3	-	-	3
24SE2E07 :: RETROFITTING & REHABILITATION OF STRUCTURES				

Course Objectives:

1. To familiarize the students with various types of deteriorations and need for rehabilitation.
2. To familiarize the student with Non – destructive testing and repairs.
3. To familiarize the student with strengthening and stabilization of deteriorated concrete structures.
4. To familiarize the student with special concretes.

Course Outcomes:

Upon the successful completion of this course, the students will be able to:

CO1: Recognize various materials for repair and rehabilitation of structures **(K2)**

CO2: Design and suggest repair strategies for deteriorated concrete structures including repairing with composites. **(K3)**

CO3: Use Bonded installation techniques for strengthening of structures. **(K3)**

CO4: Design special concretes **(K3)**

CO5: Develop High performance Concrete **(K3)**

Syllabus:

UNIT-I

Materials for repair and rehabilitation -Admixtures- types of admixtures-purposes of using admixtures-chemical composition- Natural admixtures- Fibres- wraps- Glass and Carbon fibre wraps- Steel Plates-Non destructive evaluation: Importance- Concrete behavior under corrosion, disintegrated mechanisms- moisture effects and thermal effects – Visual investigation- Acoustical emission methods- Corrosion activity measurement- chloride content – Depth of carbonation- Impact echo methods- Ultrasound pulse velocity methods- Pull out tests.

UNIT-II

Strengthening and stabilization- Techniques- design considerations-Beam shear capacity strengthening-Shear Transfer strengthening-stress reduction techniques- Column strengthening-flexural strengthening-Connection stabilization and strengthening, Crack stabilization.

UNIT-III

Bonded installation techniques- Externally bonded FRP- Wet layup sheet, bolted plate, near surface mounted FRP, fundamental debonding mechanisms-intermediate crack debondingCDC debonding- plate end debonding- strengthening of floor of structures.

UNIT-IV

Fibre reinforced concrete- Properties of constituent materials- Mix proportions, mixing and casting methods-Mechanical properties of fiber reinforced concrete- applications of fibre reinforced concretes-Light weight concrete- properties of light weight concrete- No fines concrete- design of light weight concrete- Flyash concrete-Introduction- classification of flyash- properties and reaction mechanism of flyash- Properties of flyash concrete in fresh state and hardened state- Durability of flyash concretes.

UNIT-V

High performance concretes- Introduction- Development of high performance concrete-Materials of high performance concretes-Properties of high performance concretes- Self Consolidating concrete-properties qualifications.

Text Books:

1. Maintenance Repair Rehabilitation & Minor works of Buildings- P.C. Varghese, PHI Publications.

2. Repair and Rehabilitation of Concrete Structures – P. I. Modi, C. N. Patel, PHI Publications.

Reference Books:

1. Concrete Repair and Maintenance illustrated, Peter Hemmons.
2. Handbook on Repair and Rehabilitation of RC Buildings published by CPWD, Delhi.

M.Tech II SEMESTER	L	T	P	C
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24SE2E08 :: BRIDGE ENGINEERING				

Course Objectives:

1. To choose the appropriate bridge type for a given project and
2. To understand different theories for analysis of concrete bridges.
3. To analyze and design the components of the box culverts.
4. To design the plate girder bridges.
5. To analyze and design of the sub-structures.

Course Outcomes:

Upon the successful completion of this course, the students will be able to:

CO1: Identify various structural components of the chosen bridge form**. (K2)**

CO2: Design theories for super structure and substructure of bridges, R.C.C T Beam Bridge **(K3)**

CO3: Design plate girder bridges. **(K3)**

CO4: Design Prestressed Concrete and Composite bridges **(K3)**

CO5: Analyze Stability of abutments and piers **(K3)**

Syllabus:

UNIT-I

Masonry arch Bridge design details- Rise, radius, and thickness of arch- Arch ring- Dimensioning of sub structures- Abutments pier and end connections.(Ref: IRC- SP-13)

UNIT-II

Super Structure: Slab bridge- Wheel load on slab- effective width method- slabs supported on two edges- cantilever slabs- dispersion length- Design of interior panel of slab- Pigeaud's method- design of longitudinal girders- Guyon-Messonet method- Hendry Jaegar method- Courbon's theory. (Ref: IRC-21), voided slabs, T-Beam bridges.

UNIT-III

Plate girder bridges- Elements of plate girder and their design-web-flange- intermediate stiffener- vertical stiffeners- bearing stiffener-design problem.

UNIT-IV

Prestressed Concrete and Composite bridges- Preliminary dimensions-flexural and torsional parameters- Courbon's Theory – Distribution coefficients by exact analysis- design of girder section- maximum and minimum prestressing forces- eccentricity- live load and dead load shear forces- cable zone in girder- check for stresses at various sections- check for diagonal tension- diaphragms and end block design- short term and long term deflections- Composite action of composite brides- shear connectors- composite or transformed section- design problem. (Ref: IRC: Section-VI)

UNIT-V

Sub structure- Abutments- Stability analysis of abutments- piers- loads on piers – Analysis of piers- Design problem(Ref: IRC-13, IRC-21, IRC-78)- Pipe culvert- Flow pattern in pipe culvers- culvert alignment- culvert entrance structure- Hydraulic design and structural design of pipe culverts- reinforcements in pipes .(Ref: IRC: SP-13)

Text Books:

1. Design of Bridges by N. Krishna Raju CBS Publishers and Distributors.
2. Design of Concrete Bridges- M.G. Aswini, V.N. Vazirani, M.M Ratwani, Khanna Publishers

Reference Books:

1. Concrete Bridge Design and Practice- V.K. Raina, Tata McGraw- Hill Publishing Company Limited.
2. E.C. Hambly, Bridge deck behaviour, Taylor & Francis, London, 1976.
3. E.J. O'Brien and D.L. Keogh, Bridge deck analysis, E& FN Spon, New York , 1999.
4. D. Johnson Victor, Essentials of bridge engineering, Oxford & IBH publishing Co. Ltd., New Delhi, 2001.

M.Tech II SEMESTER	L	T	P	C
	3	-	-	3
24SE2E09 :: ANALYSIS AND DESIGN OF TALL BUILDINGS				

Course Objectives:

1. To introduce various aspects of planning of tall buildings and know about different types of loads.
2. To introduce various structural systems for high rise buildings with their behaviour and analysis.
3. To impart knowledge about analysis involved in tall structures.
4. To know about sectional shapes and design for differential movement, creep and shrinkage effects.
5. To impart knowledge about stability analysis of various systems and to know about advanced topics.

Course Outcomes:

Upon the successful completion of this course, the students will be able to:

CO1: know about modern concepts of special Concretes. **(K2)**
CO2: Identify different types of loading acting on tall buildings. **(K2)**
CO3: Interpret various structural systems used in the construction of tall structures **(K3)**
CO4: Analyze and Design different components of tall structures **(K3)**
CO5: Evaluate stability analysis of frames for various secondary effects such as creep, shrinkage and temperature. **(K4)**

UNIT-I

Design Criteria Philosophy, Materials – Modern concepts – High Performance Concrete, Fibre Reinforced Concrete, Light weight concrete, Self Compacting Concrete

UNIT-II

Gravity Loading – Dead load, Live load, Impact load, Construction load, Sequential loading. Wind Loading – Static and Dynamic Approach, Analytical method, Wind Tunnel Experimental methods. Earthquake Loading – Equivalent lateral Load analysis, Response Spectrum Method, Combination of Loads.

UNIT-III

Behavior of Structural Systems- Factors affecting the growth, height and structural form, Behaviour of Braced frames, Rigid Frames, In-filled frames, Shear walls, Coupled Shear walls, Wall–Frames, Tubular, Outrigger braced, Hybrid systems.

UNIT-IV

Analysis and Design- Modeling for approximate analysis, Accurate analysis and reduction techniques, Analysis of structures as an integral unit, Analysis for member forces, drift and twist. Computerized 3D analysis. Design for differential movement, Creep and Shrinkage effects, Temperature Effects and Fire Resistance.

UNIT-V

Stability Analysis- Overall buckling analysis of frames, wall–frames, Approximate methods, Second order effect of gravity loading, P–Delta Effects, Simultaneous first order and P-Delta analysis, Translational instability, Torsional instability, Out of plumb effects, Effect of stiffness of members and foundation rotation in stability of structures.

Text Books:

1. Taranath B.S., “Structural Analysis and Design of Tall Buildings”, McGrawHill, 2011.
2. Bryan Stafford Smith and Alexcoull, “Tall Building Structures - Analysis and Design”, John Wiley and Sons, Inc., 1991.

Reference Books:

1. Gupta.Y.P., (Editor), Proceedings of National Seminar on High Rise Structures- Design and Construction Practices for Middle Level Cities, New Age International Limited, New Delhi,1995.

2. Lin T.Y and Stotes Burry D, “Structural Concepts and systems for Architects and Engineers”, John Wiley, 1988.
3. Beedle.L.S., “Advances in Tall Buildings”, CBS Publishers and Distributors, Delhi, 1986. 6. Mehta B., "High Rise Buildings" M/S Skyline, 1978.

M.Tech II SEMESTER	L	T	P	C
	3	-	-	3
24SE2E10 :: EARTHQUAKE RESISTANT DESIGN				

Course Objectives:

1. To understand the concepts of engineering seismology.
2. To have conceptual knowledge on earthquake analysis and design.
3. To get exposure to various design guidelines on earthquake resistant masonry.
4. To gain exposure to seismic design of RC.
5. To analyze various case studies on earthquake.

Course Outcomes:

Upon the successful completion of this course, the students will be able to:

CO1: Understand ground motions and explain various theories on earthquake**. (K2)**

CO2: Know the concepts of Design of earthquake resistant buildings in accordance with IS codal provisions. **(K3)**

CO3: Analyze and design ductile detailing of frames and shear walls **(K3)**

CO4: Design steel and pre- stressed concrete elements for earthquake zones**. (K3)**

CO5: Use Retrofitting and restoration techniques to buildings subjected to damage due to earthquakes **(K3)**

Syllabus:

UNIT-I

Engineering seismology – rebound theory – plate tectonics – seismic waves - earthquake size and various scales – local site effects – Indian seismicity – seismic zones of India – theory of vibrations – near ground and far ground rotation and their effects.

UNIT-II

Seismic design concepts – EQ load on simple building – load path – floor and roof diaphragms – seismic resistant building architecture – plan configuration – vertical configuration – pounding effects – mass and stiffness irregularities – torsion in structural system- Provision of seismic code (IS 1893 & 13920) – Building system – frames – shear wall – braced frames – layout design of Moment Resisting Frames(MRF) – ductility of MRF – Infill wall – Nonstructural elements.

UNIT-III

Calculation of EQ load – 3D modeling of building systems and analysis (theory only) Design and ductile detailing of Beams and columns of frames Concept of strong column weak beams, Design and ductile detailing of shear walls.

UNIT-IV

Cyclic loading behavior of RC, steel and pre- stressed concrete elements - modern concepts- Base isolation – Adaptive systems – case studies.

UNIT-V

Retrofitting and restoration of buildings subjected to damage due to earthquakes- effects of earthquakes – factors related to building damages due to earthquake- methods of seismic retrofitting- restoration of buildings.

Text Books:

1. Chopra A K, “Dynamics of Structures - Theory and Applications to Earthquake Engineering”, Prentice- Hall of India Pvt. Ltd., New Delhi, 2007.

2. Pankaj Agarwal and Manish Shrikhande, “Earthquake Resistant Design of Structures”, Prentice Hall of India Pvt. Ltd., New Delhi, 2006.
3. Edmund Booth and David Key, “Earthquake Design Practice for Buildings”, Tomas Telford publishing, Thomas Telford , London, 2006
4. Clough R W and Penzien J, “Dynamics of Structures”, McGraw Hill, INC, 1993.

Reference Books:

1. Taranath B S, “Wind and Earthquake Resistant Buildings - Structural Analysis & Design”, Marcell Decker, NewYork, 2005.
2. Chen WF & Scawthorn, “Earthquake Engineering Hand book”, CRC Press, 2003.
3. S.K.Duggal, “Earthquake Resistant Design of Structures”, Oxford University Press, 2007.
4. Norman B Green, “Earthquake Resistant Building Design and Construction”, Elsevier Science Publishing Co. Inc., New York, 1987.

M.Tech II SEMESTER	L	T	P	C
	3	-	-	3
24SE2E11 :: PLASTIC ANALYSIS AND DESIGN				

Course Objectives:

1. To understand basic difference between elastic and plastic analysis with examples
2. To have conceptual knowledge on method of Limit Analysis.
3. To get exposure to limit design Principles
4. To know about deflection in Plastic beams and frames

Course Outcomes:

Upon the successful completion of this course, the students will be able to:

CO1: Know Introduction and basic hypothesis, Virtual work in the elastic-plastic state. **(K3)**

CO2: Apply method of Limit Analysis to beams, portal frames, gable frames and grids. **(K3)**

CO3: Use Limit design Principles, and method of combining mechanisms. **(K3)**

CO4: Calculate Deflection in Plastic beams and frames**. (K3)**

CO5: Learn Minimum weight Design. **(K3)**

Syllabus:

UNIT-I

Introduction and basic hypothesis: Concepts of stress and strain – relation of steel Moment curvature relation- basic difference between elastic and plastic analysis with examples- Yield condition, idealizations, collapse criteria- Virtual work in the elastic-plastic state-Evaluation of fully plastic moment and shape factors for the various practical sections.

UNIT-II

Method of Limit Analysis: Introduction to limit analysis of simply supported fixed beams and continuous beams, Effect of partial fixity and end, invariance of collapse loads, basic theorems of limit analysis, rectangular portal frames, gable frames, grids, superposition of mechanisms, drawing statistical bending moment diagrams for checks.

UNIT-III

Limit design Principles: Basic principles, limit design theorems, application of limit design theorems, trial and error method, method of combining mechanisms, plastic moment distribution method, load replacement method, continuous beams and simple frames designs using above principles.

UNIT-IV

Deflection in Plastic beams and frames: Load deflection relations for simply supported beams, deflection of simple pin based and fixed based portal frames, method of computing deflections.

UNIT-V

Minimum weight Design: Introduction to minimum Weight and linear Weight functions Foulkes theorems and its geometrical analogue and absolute minimum weight design.

Text books:

1. B G Neal, Plastic Methods of Structural analysis, 3rd edition, Chapman and hall publications, 1977.
2. B.C.Punmia, Ashok Kumar Jain, Arun Kumar Jain, Comprehensive Design of Steel Structures, Laxmi Publications (P) Ltd.

Reference Books:

1. S K Duggal, Limit State Design of Steel Structures, McGraw Hill Education, 2010.
2. M R Shiyekar, Limit State Design of Steel Structures, PHI Publication, 3rd Edition.
3. C E Messennet, M A Seve, Plastic analysis and Design
4. A.S. Arya and J.L. Ajmani – Design of Steel Structures, Nemchand and Bros., Roorkee

M. Tech II SEMESTER	L	T	P	C
	3	-	-	3
24SE2E12 :: INDUSTRIAL STRUCTURES				

Course Objectives:

1. To impart knowledge in the area of planning and functional requirements for industrial structures.
2. To understand the basic idea about the materials and design of industry structural elements.
3. To know the design concepts of power plant structures.
4. To realize the design concepts of power transmission structures.
5. To understand the basic design concepts of chimneys, bunkers and silos and their construction techniques.

Course Outcomes:

Upon the successful completion of this course, the students will be able to:

CO1: Identify the various functional requirements of Industrial structure. **(K2)**
CO2: Design various structural elements of Industrial structure. **(K3)**
CO3: Analyze and design of folded plates. **(K4)**
CO4: Formulate the concepts in design concepts of chimneys, bunkers and silos. **(K3)**
CO5: Analyze and design power transmission structures. **(K4)**

Syllabus:

UNIT-I

Planning and functional requirements- classification of industries and industrial structures planning for layout- requirements regarding lighting ventilation and fire safety- protection against noise and vibrations.

UNIT-II

Industrial buildings- roofs for industrial buildings (Steel) - design of gantry girder- design of corbels and nibs- machine foundations.

UNIT-III

Design of Folded plates- Design considerations- analysis of folded plates- analysis of multibay folded plates- design of diaphragm beam.

UNIT-IV

Power plant structures- Bunkers and silos- chimney and cooling towers-Nuclear containment structures.

UNIT-V

Power transmission structures- transmission line towers- tower foundations- testing towers.

Text books:

1. Manohar S.N, “Tall Chimneys - Design and Construction”, Tata McGraw Hill, 1985.
2. Santha kumar A.R. and Murthy S.S., “Transmission Line Structures”, Tata McGraw Hill, 1992.

Reference Books:

1. Srinivasulu P and Vaidyanathan. C, “Handbook of Machine Foundations”, Tata McGraw Hill, 2007.
2. Jurgen Axel Adam, Katharria Hausmann, Frank Juttner, Klauss Daniel, “Industrial Buildings: A Design Manual”, Birkhauser Publishers, 2004.
3. Proceedings of Advanced course on “Industrial Structures”, Structural Engineering Research Centre, Chennai, 1982.
4. John D Holmes, ”Wind loading of structures”, Taylor and Francis, 2007.

M. Tech II SEMESTER	L	T	P	C
	-	-	2	2
24SE2L01 :: ADVANCED STRUCTURAL ENGINEERING LABORATORY				

Course Objective:

1. To perform advanced laboratory experiments that emphasizes the structure- property relationship, statistical analysis and technical manuscript preparation.

Course Outcomes:

Upon the successful completion of this course, the students will be able to:

CO1: Measure Strain using strain gauges. **(K3)**
CO2: Know the repair and rehabilitation of concrete beams. **(K3)**
CO3: Study of stress-strain curve of high strength concrete. **(K3)**
CO4: Know the chemical analysis of water, sand and Aggregate for Suitability in Construction. **(K3)**

List of Experiments:

1. Strain measurement using Electrical resistance strain gauges.
2. Repair and rehabilitation of concrete beams.
3. Measurement of strain by Lateral Extensometer and Longitudinal Compressometer.
4. Study of stress-strain curve of high strength concrete, Correlation between cube strength, cylinder strength, split tensile strength and modulus of rupture.
5. Chemical Analysis of water for suitability in concreting with and without Reinforcement.
6. Chemical Analysis of sand and Aggregate for Suitability in Construction.

Text Books:

1. Dally. J W and Riley. W F, “Experimental Stress Analysis”, 4th edition, College House Enterprise, New York, 2005.
2. Properties of Concrete by A. M. Neville, ELBS publications

Reference Book:

1. Concrete Technology by M.S. Shetty, S. Chand & Co

M.Tech II SEMESTER	L	T	P	C
	-	-	2	2
24SE2L02 :: CAD LABORATORY				

Course Objective:

1. To perform analysis and design of different structures subjected to various loads using software tools.

Course Outcomes:

Upon the successful completion of this course, the students will be able to:

CO1: Analyze and design of beams subjected to different loadings. **(K3)**
CO2: Perform analysis and design of Multistoried building. **(K3)**
CO3: Determine mode shapes and frequencies of tall buildings. **(K3)**
CO4: Perform seismic analysis and wind analysis of Multistoried building**. (K3)**
CO5: Analyze prestressed concrete bridge girder and cylindrical shell. **(K4)**

Syllabus:

Analysis and Design using STADD, STRAP, STRUDS, ANSYS

1. Programming for beams subject to different loading (mandatory).
2. Analysis of reinforced concrete multistoried building.
3. Analysis of steel transmission line tower.
4. Analysis of plane and space truss.
5. Seismic analysis of multistoried building.
6. Determination of mode shapes and frequencies of tall buildings using lumped mass (stick model) approximation.
7. Wind analysis on tall structure.
8. Analysis of pre stressed concrete bridge girder.
9. Analysis of Cylindrical shell.
10. Modal Analysis of a Cantilever Beam.

NOTE: A minimum of eight (including item 1) from the above set have to be conducted.

Reference Book:

1. Computer aided design laboratory (Civil Engineering) by Shesha Prakash and Suresh.S.

M.Tech II SEMESTER	L	T	P	C
	-	-	4	2
24SE2P01 :: MINI PROJECT WITH SEMINAR				

Course Outcomes:

Upon the successful completion of this course, the students will be able to:

CO1: Identify structural engineering problems reviewing available literature. **(K2)**

CO2: Study different techniques used to analyze complex structural systems. **(K3)**

CO3: Work on the solutions given and present solution by using his/her technique applying engineering principles. **(K3)**

Syllabus:

Mini Project will have mid semester presentation and end semester presentation. Mid semester presentation will include identification of the problem based on the literature review on the topic referring to latest literature available.

End semester presentation should be done along with the report on identification of topic for the work and the methodology adopted involving scientific research, collection and analysis of data, determining solutions highlighting individuals' contribution.

Continuous assessment of Mini Project at Mid Semester and End Semester will be monitored by the departmental committee.

M.Tech III SEMESTER	L	T	P	C
	3	-	-	3
24SE3E13 :: ANALYTICAL AND NUMERICAL METHODS FOR STRUCTURAL ENGINEERING				

Course Objectives:

1. To understand the concepts of numerical methods.
2. To solve the various structural engineering mathematical models.
3. To get Numerical Solutions for Different Structural Problems.

Course Outcomes:

Upon the successful completion of this course, the students will be able to:

CO1: Understand the fundamentals of numerical methods. **(K2)**
CO2: Obtain the solution of non linear algebraic and transcendent equations. **(K3)**
CO3: Find the solution of linear equations by using elements of matrix algebra **(K3)**
CO4: Adopt the principles and techniques of finite difference methods **(K3)**
CO5: Use computer algorithms to get Numerical Solutions for Different Structural Problems **(K3)**

Syllabus:

UNIT-I

Fundamentals of Numerical Methods: Error Analysis, Polynomial Approximations and Interpolations,

UNIT-II

Curve Fitting; Interpolation and extrapolation. Solution of Non linear Algebraic and Transcendental Equations

UNIT-III

Elements of Matrix Algebra: Solution of Systems of Linear Equations, Eigen Value Problems.

UNIT-IV

Numerical Differentiation & Integration: Solution of Ordinary and Partial Differential Equations.
Finite Difference scheme: Implicit & Explicit scheme.

UNIT-V

Computer Algorithms: Numerical Solutions for Different Structural Problems, Fuzzy Logic and Neural Network.

Text Books:

1. An Introduction to Numerical Analysis, Atkinson K.E., J. Wiley and Sons, 1989.
2. Theory and Problems of Numerical Analysis, Scheid F, McGraw Hill Book Company, (Shaum Series), 1988.

Reference Books:

1. Introductory Methods of Numerical Analysis, Sastry S. S, Prentice Hall of India, 1998.
2. Higher Engineering Maths for Engg. And Sciences Venkataraman. M. K, National Publishing Company, Chennai.

M.Tech III SEMESTER	L	T	P	C
	3	-	-	3
24SE2E14 :: PRESTRESSED CONCRETE				

Course Objectives:

1. To get exposed to various systems of pre-stressing.
2. To understand the design of flexural members for shear, bond and torsion and end blocks.
3. To acquire knowledge on continuous beams and their design.

Course Outcomes:

Upon the successful completion of this course, the students will be able to:

CO1: Understand analysis of pre-stressed concrete element using various methods. **(K2)**
CO2: Estimate the effective pre stress including the short and long term losses. **(K2)**
CO3: Design pre-stressed concrete flexural members. **(K3)**
CO4: Know the analysis and deflections of pre-stressed concrete beams. **(K3)**
CO5: Use different methods for analysis of end blocks in prestressed concrete beams**. (K3)**

Syllabus:

UNIT-I

General principles of Pre-stressing- Pre-tensioning and Post tensioning - Pre tensioning and Post tensioning methods- Different systems of Pre-stressing- Analysis of prestress and Bending stresses– Resultant – stress at a section – pressure line – concept of load balancing – stresses in tendons.

UNIT-II

Losses of Pre-stressing- Loss of Pre-stress in pre-tensioned and post tensioned members due to various causes -Elastic shortening of concrete, shrinkage of concrete, creep of concrete, Relaxation of steel, slip in anchorage, differential shrinkage- bending of members and frictional losses- Long term losses

UNIT-III

Flexural, shear; torsional resistance and design of Prestressed concrete section. Types of flexural failure – code procedures-shear and principal stresses – Prestressed concrete members in torsion – Design of sections for flexure, Axial Tension, Compression and bending, shear, Bond.

UNIT-IV

Analysis of continuous beams –Elastic theory- Linear transformation and Concordant tendons-
Deflections of pre-stressed concrete beams: Importance of control of deflections- factors influencing deflections-short term deflections of un-cracked member – prediction of long term deflections.

UNIT-V

Analysis of end blocks: By Guyon's method and Magnel's method, Anchorage zone stresses- Approximate method of design- anchorage zone reinforcement- transfer of pre stresses- pre tensioned members- Composite sections: Introduction-Analysis for stresses- differential shrinkage- general design considerations.

Text Books:

1. N. Krishna Raju, „Prestressed Concrete", 6th Edition, Tata McGraw hill, 2018.
2. S. Ramamrutham „Prestressed Concrete" 5th Edition, Dhanpat Rai Publishing Company, 2013.

Reference Books:

1. P. Dayaratnam „Prestressed Concrete", 5th Edition, Medtech Publishers, 2017.
2. T. Y. Lin & Burns „Prestressed Concrete", 3rd Edition, Wiley India Private Limited, 2010.
3. IS1343 2012 Prestressed concrete Code.

M.Tech III SEMESTER	L	T	P	C
	3	-	-	3
24SE3E15 :: STRUCTURAL HEALTH MONITORING				

Course Objectives:

1. Understand the fundamentals of health monitoring of structures.
2. Apply Structural health monitoring principles to inspect distressed structures.
3. Using static field methods as tool of SHM.
4. Employ dynamic field tests to assess the structure.
5. Select repairs and rehabilitation measures for the distressed structure.

Course Outcomes:

Upon the successful completion of this course, the students will be able to:

CO1: Explain the fundamentals and need of health monitoring of structures. **(K2)**
CO2: Diagnose the distress in the structure understanding the causes and factors. **(K2)**
CO3: Assess the health of structure using static field methods. **(K3)**
CO4: Assess the health of structure using dynamic field tests. **(K3)**
CO5: Suggest repairs and rehabilitation measures of the structure.**(K3)**

Syllabus:

UNIT-I

Structural Health: Factors affecting Health of Structures, Causes of Distress, Regular Maintenance.
Structural Health Monitoring: Concepts, Various Measures, Structural Safety in Alteration.

UNIT-II

Structural Audit: Assessment of Health of Structure, Collapse and Investigation, Investigation Management, SHM Procedures.

UNIT-III

Static Field Testing: Types of Static Tests, Simulation and Loading Methods, sensor systems and hardware requirements, Static Response Measurement.

UNIT-IV

Dynamic Field Testing: Types of Dynamic Field Test, Stress History Data, Dynamic Response Methods, Hardware for Remote Data Acquisition Systems, Remote Structural Health Monitoring.

UNIT-V

Introduction to Repairs and Rehabilitations of Structures: Case Studies (Site Visits), piezo– electric materials and other smart materials, electro–mechanical impedance (EMI) technique, adaptations of EMI technique.

Text Books:

1. Structural Health Monitoring, Daniel Balageas, Claus Peter Fritzen, Alfredo Güemes, John Wiley and Sons, 2006.
2. Health Monitoring of Structural Materials and Components Methods with Applications, Douglas E Adams, John Wiley and Sons, 2007.

Reference Books:

1. Structural Health Monitoring and Intelligent Infrastructure, Vol1, J. P. Ou, H. Li and Z. D. Duan, Taylor and Francis Group, London, UK, 2006.
2. Structural Health Monitoring with Wafer Active Sensors, Victor Giurglutiu, Academic Press Inc, 2007.

M.Tech III SEMESTER	L	T	P	C
	3	-	-	3
24CM3O01 :: BUSINESS ANALYTICS				

Course Objectives:

1. To demonstrate the awareness and Knowledge of Business Analytics
2. To apply the basic concepts of analytics to the business scenarios and extend the knowledge about future trends in business analytics.
3. To interpret the analytics methodology
4. To assess the relevance and effectiveness of business analytics solutions
5. To apply the knowledge of technical skills in descriptive and predictive modelling to support business decision-making

Course Outcomes:

Upon the successful completion of this course, the students will be able to:

CO1: Recall Business Analytics and manipulate data **(K1)**
CO2: Recite the fundamental tools and methods of data analysis and statistics. **(K1)**
CO3: Express forecasting techniques and data mining techniques. **(K2)**
CO4: Compare model and solve decision problems in different setting **(K2)**
CO5: Relate Decision Problems, Decision trees **(K3)**

Syllabus:

UNIT-I

Business analytics: Overview of Business analytics, Scope of Business analytics, Business Analytics Process, Relationship of Business Analytics Process and organisation, competitive advantages of Business Analytics.

Statistical Tools: Statistical Notation, Descriptive Statistical methods, Review of probability distribution and data modelling, sampling and estimation methods overview.

UNIT-II

Trendiness and Regression Analysis: Modeling Relationships and Trends in Data, simple Linear Regression. Important Resources, Business Analytics Personnel, Data and models for Business analytics, problem solving, Visualizing and Exploring Data, Business Analytics Technology.

UNIT-III

Organization Structures of Business analytics, Team management, Management Issues, Designing Information Policy, Outsourcing, Ensuring Data Quality, Measuring contribution of Business analytics, Managing Changes.

Descriptive Analytics, predictive analytics, predicative Modeling, Predictive analytics analysis, Data Mining, Data Mining Methodologies, Prescriptive analytics and its step in the business analytics Process, Prescriptive Modeling, nonlinear Optimization.

UNIT-IV

Forecasting Techniques: Qualitative and Judgmental Forecasting, Statistical Forecasting Models, Forecasting Models for Stationary Time Series, Forecasting Models for Time Series with a Linear Trend, Forecasting Time Series with Seasonality, Regression. Forecasting with Casual Variables, Selecting Appropriate Forecasting Models.

Monte Carlo Simulation and Risk Analysis: Monte Carle Simulation Using Analytic Solver Platform, New-Product Development Model, Newsvendor Model, Overbooking Model, Cash Budget Model.

UNIT-V

Decision Analysis: Formulating Decision Problems, Decision Strategies with the without Outcome Probabilities, Decision Trees, The Value of Information, Utility and Decision Making.

Recent Trends in Embedded and collaborative business intelligence, Visual data recovery, Data Storytelling and Data journalism.

Text Book:

1. Business analytics Principles, Concepts, and Applications by Marc J. Schniederjans, Dara G. Schniederjans, Christopher M. Starkey, Pearson FT Press.

Reference Book:

1. Business Analytics by James Evans, persons Education.

M.Tech III SEMESTER	L	T	P	C
	3	-	-	3
24CC3O02 :: INDUSTRIAL SAFETY				

Course Objectives:

1. To achieve an understanding of principles of safety management.
2. To enable the students to learn about various functions and activities of safety department.
3. To enable students to conduct safety audit and write audit reports effectively in auditing situations.
4. To have knowledge about sources of information for safety promotion and training.
5. To familiarize students with evaluation of safety performance.

Course Outcomes:

Upon the successful completion of this course, the students will be able to:

CO1: Recall learning on Safety Management Concept and its Principles **(K1)**
CO2: Recite identification of tools used for maintenance **(K1)**
CO3: Express forecasting techniques of Wear and Corrosion and their prevention **(K2)**
CO4: Identify problems in machine tools, hydraulic, pneumatic, automotive, thermal and electrical equipment's **(K2)**
CO5: Relate Periodic and preventive maintenance **(K3)**

Syllabus:

UNIT-I

Industrial safety: Accident, causes, types, results and control, mechanical and electrical hazards, types, causes and preventive steps/procedure, describe salient points of factories act 1948 for health and safety, wash rooms, drinking water layouts, light, cleanliness, fire, guarding, pressure vessels, etc, Safety color codes. Fire prevention and firefighting, equipment and methods.

UNIT-II

Fundamentals of maintenance engineering: Definition and aim of maintenance engineering, Primary and secondary functions and responsibility of maintenance department, Types of maintenance, Types and applications of tools used for maintenance, Maintenance cost & its relation with replacement economy, Service life of equipment.

UNIT-III

Wear and Corrosion and their prevention: Wear- types, causes, effects, wear reduction methods, lubricants-types and applications, Lubrication methods, general sketch, working and applications, i. Screw down grease cup, ii. Pressure grease gun, iii. Splash lubrication, iv. Gravity lubrication, v. Wick feed lubrication vi. Side feed lubrication, vii. Ring lubrication, Definition, principle and factors affecting the corrosion. Types of corrosion, corrosion prevention methods.

UNIT-IV

Fault tracing: Fault tracing-concept and importance, decision tree concept, need and applications, sequence of fault finding activities, show as decision tree, draw decision tree for problems in machine tools, hydraulic, pneumatic, automotive, thermal and electrical equipment's like, I. Any one machine tool, ii. Pump iii. Air compressor, iv. Internal combustion engine, v. Boiler, vi Electrical motors, Types of faults in machine tools and their general causes.

UNIT-V

Periodic and preventive maintenance: Periodic inspection-concept and need, degreasing, cleaning and repairing schemes, overhauling of mechanical components, overhauling of electrical motor, common troubles and remedies of electric motor, repair complexities and its use, definition, need, steps and advantages of preventive maintenance. Steps/procedure for periodic and preventive maintenance of: I.

Machine tools, ii. Pumps, iii. Air compressors, iv. Diesel generating (DG) sets, Program and schedule of preventive maintenance of mechanical and electrical equipment, advantages of preventive maintenance. Repair cycle concept and importance

Text Books:

1. Maintenance Engineering Handbook, Higgins & Morrow, Da Information Services.
2. Maintenance Engineering, H. P. Garg, S. Chand and Company.

Reference Books:

1. Pump-hydraulic Compressors, Audels, Mcgrew Hill Publication.
2. Foundation Engineering Handbook, Winterkorn, Hans, Chapman & Hall London.

M. Tech III SEMESTER	L	T	P	C
	3	-	-	3
24CC3O03 :: OPERATIONS RESEARCH				

Course Objectives:

1. Ability to understand and analyze managerial problems in industry so that they are able to use resources (capitals, materials, machines etc) more effectively.
2. Knowledge of formulating mathematical models for quantitative analysis of managerial problems in industry

Course Outcomes:

Upon the successful completion of this course, the students will be able to:

CO1: Formulate the resource management problem and identify appropriate methods to solve them. **(K3)**

CO2: Apply transportation model to optimize the industrial resources. **(K3)**

CO3: Solve sequencing problems using operation research techniques. **(K3)**

CO4: Apply there placement model to increase the efficiency of the system. **(K3)**

CO5: Apply the inventory and queuing model to increase the efficiency of the system. **(K4)**

Syllabus:

UNIT-I

Optimization Techniques, Model Formulation, models, General L.R Formulation, Simplex Techniques, Sensitivity Analysis, Inventory Control Models.

UNIT-II

Formulation of a LPP - Graphical solution revised simplex method - duality theory - dual simplex method - sensitivity analysis - parametric programming.

UNIT-III

Nonlinear programming problem - Kuhn-Tucker conditions min cost flow problem - max flow problem - CPM/PERT.

UNIT-IV

Scheduling and sequencing - single server and multiple server models - deterministic inventory models - Probabilistic inventory control models - Geometric Programming.

UNIT-V

Competitive Models, Single and Multi-channel Problems, Sequencing Models, Dynamic Programming, Flow in Networks, Elementary Graph Theory, Game Theory Simulation.

Text Books:

1. H.A. Taha, Operations Research, An Introduction, PHI, 2008.
2. H.M. Wagner, Principles of Operations Research, PHI, Delhi, 1982.
3. J.C. Pant, Introduction to Optimisation: Operations Research, Jain Brothers, Delhi, 2008.

Reference Books:

1. Hitler Libermann Operations Research: McGraw Hill Pub. 2009.
2. Pannerselvam, Operations Research: Prentice Hall of India 2010.
3. Harvey M Wagner, Principles of Operations Research: Prentice Hall of India 2010.

M.Tech III SEMESTER	L	T	P	C
	3	-	-	3
24MB3O04 :: COST MANAGEMENT OF ENGINEERING PROJECTS				

Course Objectives:

1. To attain knowledge in Cost Management process and Costing System.
2. Ability to understand the basic concepts of Project planning, execution, and cost control.
3. Discuss about Various types of costs and its behaviour along with Quality Management
4. Identify various types of Budgets involved in Cost Management process.
5. Broaden the career potential of available techniques and problems available in Cost Management.

Course Outcomes:

Upon the successful completion of this course, the students will be able to:

CO1: Recall Discuss various construction costs to manage a construction project **(K1)**
CO2: Summarize different construction activities and its application related to cost based on the field requirements **(K1)**
CO3: Express Cost Behaviour of various types of cost and Quality Management **(K2)**
CO4: Identifying various construction Budgets involved Cost Management process **(K2)**
CO5: Discuss various types of Techniques and Problem-solving techniques involved in Construction **(K3)**

Syllabus:

UNIT-I

Introduction and Overview of the Strategic Cost Management Process. Cost concepts in decision-making; Relevant cost, Differential cost, Incremental cost and Opportunity cost. Objectives of a Costing System; Inventory valuation; Creation of a Database for operational control; Provision of data for Decision-Making.

UNIT-II

Project: meaning, Different types, why to manage, cost overruns centres, various stages of project execution: conception to commissioning. Project execution as conglomeration of technical and non- technical activities. Detailed Engineering activities. Pre project execution main clearances and documents Project team: Role of each member. Importance Project site: Data required with significance. Project contracts. Types and contents. Project execution Project cost control. Bar charts and Network diagram. Project commissioning: mechanical and process

UNIT-III

Cost Behavior and Profit Planning Marginal Costing; Distinction between Marginal Costing and Absorption Costing; Break-even Analysis, Cost-Volume-Profit Analysis. Various decision-making problems. Standard Costing and Variance Analysis. Pricing strategies: Pareto Analysis. Target costing, Life Cycle Costing. Costing of service sector. Just-in-time approach, Material Requirement Planning, Enterprise Resource Planning, Total Quality Management and Theory of constraints.

UNIT-IV

Activity-Based Cost Management, Bench Marking; Balanced Score Card and Value-Chain Analysis. Budgetary Control; Flexible Budgets; Performance budgets; Zero-based budgets. Measurement of Divisional profitability pricing decisions including transfer pricing.

UNIT-V

Quantitative techniques for cost management, Linear Programming, PERT/CPM, Transportation problems, Assignment problems, Simulation, Learning Curve Theory.

Text Books:

1. Cost Accounting A Managerial Emphasis, Prentice Hall of India, New Delhi
2. Charles T. Horngren and George Foster, Advanced Management Accounting
3. Robert S Kaplan Anthony A. Alkinson, Management & Cost Accounting.

Reference Books:

1. Ashish K. Bhattacharya, Principles & Practices of Cost Accounting A. H. Wheeler publisher
2. N.D. Vohra, Quantitative Techniques in Management, Tata McGraw Hill Book Co. Ltd.

M. Tech III SEMESTER	L	T	P	C
	3	-	-	3
24CC3O05 :: COMPOSITE MATERIALS				

Course Objectives:

1. Train students on composite materials – definition, advantages and classification.
2. Equip students with knowledge on composite strengthening addition of components and their production routes.
3. Familiarize students about the properties and response of composite structures subjected to mechanical loading.

Course Outcomes:

Upon the successful completion of this course, the students will be able to:

CO1: Explain the advantages and applications of composite materials.**(K2)**
CO2: Describe the properties of various reinforcements of composite materials. **(K3)**
CO3: Summarize the manufacture of metal matrix, ceramic matrix and C-C composites**. (K2)**
CO4: Describe the manufacture of polymer matrix composites. **(K3)**
CO5: Formulate the failure theories of composite materials**. (K3)**

Syllabus:

UNIT–I

INTRODUCTION: Definition – Classification and characteristics of Composite materials. Advantages and application of composites. Functional requirements of reinforcement and matrix. Effect of reinforcement (size, shape, distribution, volume fraction) on overall composite performance.

UNIT – II

REINFORCEMENTS: Preparation-layup, curing, properties and applications of glass fibers, carbon fibers, Kevlar fibers and Boron fibers. Properties and applications of whiskers, particle reinforcements. Mechanical Behavior of composites: Rule of mixtures, Inverse rule of mixtures. Isostrain and Isostress conditions.

UNIT – III

Manufacturing of Metal Matrix Composites: Casting – Solid State diffusion technique, Cladding – Hot isostatic pressing. Properties and applications. Manufacturing of Ceramic Matrix Composites: Liquid Metal Infiltration – Liquid phase sintering. Manufacturing of Carbon – Carbon composites: Knitting, Braiding, Weaving. Properties and applications.

UNIT–IV

Manufacturing of Polymer Matrix Composites: Preparation of Moulding compounds and prepregs – hand layup method – Autoclave method – Filament winding method – Compression moulding – Reaction injection moulding. Properties and applications.

UNIT – V

Strength: Laminar Failure Criteria-strength ratio, maximum stress criteria, maximum strain criteria, interacting failure criteria, hygrothermal failure. Laminate first play failure-insight strength; Laminate strength-ply discount truncated maximum strain criterion; strength design using caplet plots; stress concentrations.

Text Books:

1. Material Science and Technology – Vol 13 – Composites by R.W.Cahn – VCH, West Germany.
2. Materials Science and Engineering, An introduction. WD Callister, Jr., Adapted by R. Balasubramaniam, John Wiley & Sons, NY, Indian edition, 2007.

Reference Books:

1. Hand Book of Composite Materials-ed-Lubin.
2. Composite Materials – K.K.Chawla.
3. Composite Materials Science and Applications – Deborah D.L. Chung.
4. Composite Materials Design and Applications – Danial Gay, Suong V. Hoa, and Stephen W. Tasi.

M.Tech III SEMESTER	L	T	P	C
	3	-	-	3
24PE3O06 :: WASTE TO ENERGY				

Course objectives:

1. To enable students to understand of the concept of Waste to Energy.
2. To link legal, technical and management principles for production of energy form waste.
3. To learn about the best available technologies for waste to energy.
4. To analyze of case studies for understanding success and failures.
5. To facilitate the students in developing skills in the decision making process.

Course out comes:

Upon the successful completion of this course, the students will be able to:

CO1: Recall different types of waste and understand the principles behind waste-to- energy conversion processes **(K1)**

CO2: Understand the suitability of different waste-to-energy conversion methods for specific waste types. **(K2)**

CO3: Summarize the manufacture of Biomass Gasification. **(K2)**

CO4: Design and implement waste-to-energy projects **(K3)**

CO5: Apply practical experience in waste-to-energy conversion techniques **(K3)**

Syllabus:

UNIT–I

Introduction to Energy from Waste: Classification of waste as fuel – Agro based, Forest residue, Industrial waste - MSW – Conversion devices – Incinerators, gasifiers, digestors.

UNIT–II

Biomass Pyrolysis: Pyrolysis – Types, slow fast – Manufacture of charcoal – Methods - Yields and application – Manufacture of pyrolytic oils and gases, yields and applications.

UNIT–III

Biomass Gasification: Gasifiers – Fixed bed system – Downdraft and updraft gasifiers – Fluidized bed gasifiers – Design, construction and operation – Gasifier burner arrangement for thermal heating – Gasifier engine arrangement and electrical power – Equilibrium and kinetic consideration in gasifier operation.

UNIT–IV

Biomass Combustion: Biomass stoves – Improved chullahs, types, some exotic designs, Fixed bed combustors, Types, inclined grate combustors, Fluidized bed combustors, Design, construction and operation - Operation of all the above biomass combustors.

UNIT–V

Biogas: Properties of biogas (Calorific value and composition) - Biogas plant technology and status - Bio energy system - Design and constructional features - Biomass resources and their classification - Biomass conversion processes - Thermo chemical conversion - Direct combustion - biomass gasification - pyrolysis and liquefaction - biochemical conversion - anaerobic digestion - Types of biogas Plants – Applications - Alcohol production from biomass - Bio diesel production - Urban waste to energy conversion - Biomass energy programme in India.

Text Books:

1. Non Conventional Energy, Desai, Ashok V., Wiley Eastern Ltd., 1990.
2. Biogas Technology - A Practical Hand Book - Khandelwal, K. C. and Mahdi, S. S., Vol. I & II, Tata McGraw Hill Publishing Co. Ltd., 1983.

Reference Books:

1. Food, Feed and Fuel from Biomass, Challal, D. S., IBH Publishing Co. Pvt. Ltd., 1991.
2. Biomass Conversion and Technology, C. Y. WereKo-Brobby and E. B. Hagan, John Wiley & Sons, 1996.

M.Tech III SEMESTER	L	T	P	C
	-	-	20	10
PROIJECT PHASE-I				

Course Outcomes:

Upon the successful completion of this course, the students will be able to:

CO1: Identify structural engineering problems reviewing available literature. **(K2)**

CO2: Identify appropriate techniques to analyze complex structural systems. **(K2)**

CO3: Apply engineering and management principles through efficient handling of project. **(K3)**

Syllabus:

Project phase-I will have mid semester presentation and end semester presentation. Mid semester presentation will include identification of the problem based on the literature review on the topic referring to latest literature available.

End semester presentation should be done along with the report on identification of topic for the work and the methodology adopted involving scientific research, collection and analysis of data, determining solutions and must bring out individuals contribution.

Continuous assessment of Project phase – I and Project phase – II at Mid Semester and End Semester will be monitored by the departmental committee.

M.Tech IV SEMESTER	L	T	P	C
	-	-	32	16
24SE4P01: PROJECT PHASE-II				

Course Outcomes:

Upon the successful completion of this course, the students will be able to:

CO1: Solve complex structural problems by applying appropriate techniques and tools**. (K3)**

CO2: Exhibit good communication skill to the engineering community and society**. (K4)**

CO3: Demonstrate professional ethics and work culture. **(K4)**

Syllabus:

Project phase – II will be extension of the to work on the topic identified in Project phase – I.

Continuous assessment should be done of the work done by adopting the methodology decided involving numerical analysis/ conduct experiments, collection and analysis of data, etc. There will be pre submission seminar at the end of academic term. After the approval the student has to submit the detail report and external examiner is called for the viva-voce to assess along with guide.

M. Tech I & II SEMESTERS	L	T	P	C
	2	-	-	2
24ACXM01 :: ENGLISH FOR RESEARCH PAPER WRITING (Audit Course - I & II)				

Course objectives: Students will be able to:

1. Understand that how to improve your writing skills and level of readability
2. Learn about what to write in each section
3. Understand the skills needed when writing a Title Ensure the good quality of paper at very first-time submission.

Course Outcomes:

Upon the successful completion of this course, the students will be able to:

CO1: Reflect on their previous writing experiences and enhance their current and future Learning. **(K2)**

CO2: Interpret, summarize and critique academic texts. **(K2)**

CO3: Gather, evaluate and synthesize information from different academic sources. **(K3)**

CO4: Use a process writing approach: from planning to drafting and revising, to create different genres of academic texts. **(K3)**

CO5: Identify good academic writing practices and adopt such practices to maintain academic honesty and avoid plagiarism during the writing process. **(K2)**

Syllabus:

UNIT-I:

Planning and Preparation, Word Order, Breaking up long sentences, Structuring Paragraphs and Sentences, Being Concise and Removing Redundancy, Avoiding Ambiguity and Vagueness

UNIT-II:

Clarifying Who Did What, Highlighting Your Findings, Hedging and Criticizing, Paraphrasing and Plagiarism, Sections of a Paper, Abstracts. Introduction

UNIT-III:

Review of the Literature, Methods, Results, Discussion, Conclusions, The Final Check.

UNIT-IV:

key skills are needed when writing a Title, key skills are needed when writing an Abstract, key skills are needed when writing an Introduction, skills needed when writing a Review of the Literature,

UNIT-V:

skills are needed when writing the Methods, skills needed when writing the Results, skills are needed when writing the Discussion, skills are needed when writing the Conclusions. useful phrases, how to ensure paper is as good as it could possibly be the first- time submission

Text Books

1. Goldbort R (2006) Writing for Science, Yale University Press (available on Google Books)
2. Day R (2006) How to Write and Publish a Scientific Paper, Cambridge University Press

Reference Books:

1. Highman N (1998), Handbook of Writing for the Mathematical Sciences, SIAM. Highman's book.
2. Adrian Wall work, English for Writing Research Papers, Springer New York Dordrecht Heidelberg London, 2011.

M.Tech I & II SEMESTERS	L	T	P	C
	2	-	-	2
24ACXM02 :: DISASTER MANAGEMENT (Audit Course – I & II)				

Course Objectives: Students will be able to

1. learn to demonstrate a critical understanding of key concepts in disaster risk reduction and humanitarian response.
2. critically evaluate disaster risk reduction and humanitarian response policy and practice from multiple perspectives.
3. develop an understanding of standards of humanitarian response and practical relevance in specific types of disasters and conflict situations.
4. critically understand the strengths and weaknesses of disaster management approaches,
5. planning and programming in different countries, particularly their home country or the countries they work in.

Course Outcomes:

Upon the successful completion of this course, the students will be able to:

CO1: Understand the nature of disasters, their types and effects**. (K2)**

CO2: Know the nature of natural and manmade disasters, their types and effects**. (K2)**

CO3: Assess the risk and reduce disaster impact. **(K3)**

CO4: Demonstrate, and practice disaster risk reduction activities towards sustainable development. **(K3)**

CO5: Describe Emerging Trends in Mitigation. **(K3)**

Syllabus:

UNIT-I:

Introduction: Disaster: Definition, Factors and Significance; Difference between Hazard and Disaster; Natural and Manmade Disasters: Difference, Nature, Types and Magnitude.

Disaster Prone Areas in India:

Study of Seismic Zones; Areas Prone to Floods and Droughts, Landslides and Avalanches; Areas Prone to Cyclonic and Coastal Hazards with Special Reference to Tsunami; Post-Disaster Diseases and Epidemics

UNIT-II:

Repercussions of Disasters and Hazards: Economic Damage, Loss of Human and Animal Life, Destruction of Ecosystem. Natural Disasters: Earthquakes, Volcanisms, Cyclones, Tsunamis, Floods, Droughts and Famines, Landslides and Avalanches, Man-made disaster: Nuclear Reactor Meltdown, Industrial Accidents, Oil Slicks and Spills, Outbreaks of Disease and Epidemics, War and Conflicts.

UNIT-III:

Disaster Preparedness and Management: Preparedness: Monitoring of Phenomena Triggering A Disaster or Hazard; Evaluation of Risk: Application of Remote Sensing, Data from Meteorological and Other Agencies, Media Reports: Governmental and Community Preparedness.

UNIT-IV:

Risk Assessment Disaster Risk: Concept and Elements, Disaster Risk Reduction, Global and National Disaster Risk Situation. Techniques of Risk Assessment, Global Co-Operation in Risk Assessment and Warning, People's Participation in Risk Assessment. Strategies for Survival.

UNIT-V:

Disaster Mitigation: Meaning, Concept and Strategies of Disaster Mitigation, Emerging Trends In Mitigation. Structural Mitigation and Non-Structural Mitigation, Programs of Disaster Mitigation in India.

Text Books:

1. R. Nishith, Singh AK, "Disaster Management in India: Perspectives, issues and strategies "'New Royal book Company.
2. Sahni, Pardeep Et. Al. (Eds.)," Disaster Mitigation Experiences and Reflections", Prentice Hall of India, New Delhi.

Reference Book:

1. Goel S. L., Disaster Administration and Management Text and Case Studies", Deep &Deep Publication Pvt. Ltd., New Delhi.

M. Tech I & II SEMESTERS	L	T	P	C
	2	-	-	2
24ACXM03 :: SANSKRIT FOR TECHNICAL KNOWLEDGE (Audit Course - I & II)				

Course Objectives:

1. To get a working knowledge in illustrious Sanskrit, the scientific language in the world
2. Learning of Sanskrit to improve brain functioning
3. Learning of Sanskrit to develop the logic in mathematics, science & other subjects enhancing the memory power
4. The engineering scholars equipped with Sanskrit will be able to explore the huge knowledge from ancient literature

Course Outcomes:

Upon the successful completion of this course, the students will be able to:

CO1: Learn alphabets in Sanskrit **language (K2)**
CO2: Get knowledge on simple tenses in Sanskrit language **(K2)**
CO3: Understand basic Sanskrit language **(K2)**
CO2: Understand Ancient Sanskrit literature about science & technology **(K2)**
CO3: Develop logic in students being a logical language **(K3)**

Syllabus:

UNIT-I:
Alphabets in Sanskrit,

UNIT-II:
Past/Present/Future Tense, Simple Sentences

UNIT-III:
Order, Introduction of roots,

UNIT-IV:
Technical information about Sanskrit Literature

UNIT-V:
Technical concepts of Engineering-Electrical, Mechanical, Architecture, Mathematics

Text Books:

1. "Abhyaspustakam" – Dr. Vishwas, Samskrita-Bharti Publication, New Delhi
2. "Teach Yourself Sanskrit" Prathama Deeksha-Vempati Kutumbshastri, Rashtriya Sanskrit Sansthanam, New Delhi Publications.

Reference Books:

1. "India's Glorious Scientific Tradition" Suresh Soni, Ocean books (P) Ltd., New Delhi.

M. Tech I & II SEMESTERS	L	T	P	C
	2	-	-	2
24ACXM04 :: VALUE EDUCATION (Audit Course - I & II)				

Course Objectives: Students will be able to

1. Understand value of education and self- development
2. Imbibe good values in students
3. Let the should know about the importance of character

Course Outcomes:

Upon the successful completion of this course, the students will be able to:

CO1: Gain Knowledge of self-development. **(K2)**
CO2: Learn the importance of Human values. **(K2)**
CO3: Develop the overall personality. **(K3)**
CO4: Develop Self-resilience. **(K3)**
CO5: Assess the impact of Ethics and values on global development. **(K3)**

Syllabus:

UNIT-I:

Values and self-development –Social values and individual attitudes. Work ethics, Indian vision of humanism. Moral and non- moral valuation. Standards and principles. Value judgements

UNIT-II:

Importance of cultivation of values. Sense of duty. Devotion, Self-reliance. Confidence, Concentration. Truthfulness, Cleanliness. Honesty, Humanity. Power of faith, National Unity. Patriotism. Love for nature, Discipline

UNIT-III:

Personality and Behavior Development - Soul and Scientific attitude. Positive Thinking. Integrity and discipline, Punctuality, Love and Kindness.

UNIT-IV:

Avoid fault Thinking. Free from anger, Dignity of labour. Universal brotherhood and religious tolerance. True friendship. Happiness Vs suffering, love for truth. Aware of self-destructive habits. Association and Cooperation. Doing best for saving nature

UNIT-V:

Character and Competence –Holy books vs Blind faith. Self-management and Good health. Science of reincarnation, Equality, Nonviolence, Humility, Role of Women. All religions and same message. Mind your Mind, Self-control. Honesty, Studying effectively

Text Book:

1. Chakroborty, S.K. “Values and Ethics for organizations Theory and practice”, Oxford University Press, New Delhi.

Referece Book:

1. Dr. S. Arulsamy, “ Peace and Value Education”, Bookman Publishers.

M.Tech I & II SEMESTERS	L	T	P	C
	2	-	-	2
24ACXM05 :: CONSTITUTION OF INDIA (Audit Course - I & II)				

Course Objectives: Students will be able to:

1. Understand the premises informing the twin themes of liberty and freedom from a civil rights perspective.
2. Address the growth of Indian opinion regarding modern Indian intellectuals' constitutional role and entitlement to civil and economic rights as well as the emergence of nationhood in the early years of Indian nationalism.
3. Address the role of socialism in India after the commencement of the Bolshevik Revolution in 1917 and its impact on the initial drafting of the Indian Constitution.

Course Outcomes:

Upon the successful completion of this course, the students will be able to:

CO1: Understand the principles of the Indian Constitution. **(K2)**
CO2: Identify the growth of the demand for civil rights in India. **(K2)**
CO3: Understand the organizations of the governance. **(K2)**
CO4: Know the role and functions of local administration. **(K2)**
CO5: Understand the role and functioning of Election Commission**. (K2)**

Syllabus:

UNIT-I:

History of Making of the Indian Constitution: History Drafting Committee, (Composition & Working), **Philosophy of the Indian Constitution:** Preamble**,** Salient Features.

UNIT-II:

Contours of Constitutional Rights & Duties: Fundamental Rights Right to Equality**,** Right to Freedom**,** Right against Exploitation**,** Right to Freedom of Religion**,** Cultural and Educational Rights**,** Right to Constitutional Remedies, Directive Principles of State Policy**,** Fundamental Duties.

UNIT-III:

Organs of Governance: Parliament**,** Composition**,** Qualifications and Disqualifications**,** Powers and Functions**,** Executive**,** President**,** Governor**,** Council of Ministers, Judiciary, Appointment and Transfer of Judges, Qualification, Powers and Functions.

UNIT-IV:

Local Administration: District's Administration head: Role and Importance, Municipalities: Introduction, Mayor and role of Elected Representative, CEO of Municipal Corporation. Pachayati raj: Introduction, PRI: Zila Pachayat. Elected officials and their roles, CEO Zila Pachayat: Position and role. Block level: Organizational Hierarchy (Different departments), Village level: Role of Elected and Appointed officials, Importance of grass root democracy.

UNIT-V:

Election Commission: Election Commission: Role and Functioning. Chief Election Commissioner and Election Commissioners. State Election Commission: Role and Functioning. Institute and Bodies for the welfare of SC/ST/OBC and women.

Text Books:

1. The Constitution of India, 1950 (Bare Act), Government Publication.
2. Dr. S. N. Busi, Dr. B. R. Ambedkar framing of Indian Constitution, 1st Edition, 2015.

Reference Books:

1. M. P. Jain, Indian Constitution Law, 7th Edn., Lexis Nexis, 2014.
2. D.D. Basu, Introduction to the Constitution of India, Lexis Nexis, 2015.

M. Tech I & II SEMESTERS	L	T	P	C
	2	-	-	2
24ACXM06 :: PEDAGOGY STUDIES (Audit Course - I & II)				

Course Objectives: Students will be able to:

1. Understand the concepts of pedagogy and the importance of teaching methods
2. Identify critical evidence gaps to guide the development.

Course Outcomes:

Upon the successful completion of this course, the students will be able to:

CO1: Understand the basics of Pedagogy **(K2)**
CO2: Know the pedagogical practices used by teachers in formal and informal classrooms in developing countries. **(K2)**
CO3: Realize the effectiveness of pedagogical practices. **(K2)**
CO4: Support for class room management. **(K2)**
CO5: Know the methods for improving teaching methodologies**. (K2)**

Syllabus:

UNIT-I:

Introduction and Methodology: Aims and rationale, Policy background, Conceptual framework and terminology Theories of learning, Curriculum, Teacher education. Conceptual framework, Research questions**.** Overview of methodology and Searching.

UNIT-II:

Thematic overview: Pedagogical practices are being used by teachers in formal and informal classrooms in developing countries. Curriculum, Teacher education.

UNIT-III:

Evidence on the effectiveness of pedagogical practices, Methodology for the indepth stage: quality assessment of included studies. How can teacher education (curriculum and practicum) and the scho curriculum and guidance materials best support effective pedagogy? Theory of change. Strength and nature of the body of evidence for effective pedagogical practices. Pedagogic theory and pedagogical approaches. Teachers' attitudes and beliefs and Pedagogic strategies.

UNIT-IV:

Professional development: alignment with classroom practices and follow-up support, Peer support, Support from the head teacher and the community. Curriculum and assessment, Barriers to learning: limited resources and large class sizes

UNIT-V:

Research gaps and future directions: Research design**,** Contexts**,** Pedagogy**,** Teacher education**,** Curriculum and assessment**,** Dissemination and research impact.

Reference Books:

1. Ackers J, Hardman F (2001) Classroom interaction in Kenyan primary schools, Compare, 31 (2): 245-261.
2. Agrawal M (2004) Curricular reform in schools: The importance of evaluation, Journal of Curriculum Studies, 36 (3): 361-379.
3. Akyeampong K (2003) Teacher training in Ghana - does it count? Multi-site teacher education research project (MUSTER) country report 1. London: DFID.

4. Akyeampong K, Lussier K, Pryor J, Westbrook J (2013) Improving teaching and learning of basic maths and reading in Africa: Does teacher preparation count? International Journal Educational Development, 33 (3): 272–282.
5. Alexander RJ (2001) Culture and pedagogy: International comparisons in primary education. Oxford and Boston: Blackwell.
6. Chavan M (2003) Read India: A mass scale, rapid, 'learning to read' campaign.
7. www.pratham.org/images/resource%20working%20paper%202.pdf.

M.Tech I & II SEMESTERS	L	T	P	C
	2	-	-	2
24ACXM07 :: STRESS MANAGEMENT BY YOGA (Audit Course - I & II)				

Course Objectives:

1. To achieve overall health of body and mind
2. To overcome stress

Course Outcomes:

Upon the successful completion of this course, the students will be able to:

CO1: Develop healthy mind in a healthy body thus improving social health also improve efficiency **(K3)**

CO2: Develop body awareness, learn how to use their bodies in a healthy way and perform well in sports and academics. **(K3)**

CO3: Know Balance, flexibility, stamina, strengthen muscles and connective tissues enabling good posture. **(K3)**

CO4: Manage stress through breathing, awareness, meditation and healthy movement. **(K3)**

CO5: Build concentration, Confidence and positive self-image. **(K3)**

Syllabus:

UNIT-I:

Definitions of Eight parts of yog. (Ashtanga)

UNIT-II:

Yam and Niyam.

UNIT-III:

Do`s and Don't's in life.

i) Ahinsa, satya, astheya, bramhacharya and aparigraha

ii) Shaucha, santosh, tapa, swadhyay, ishwarpranidhan

UNIT-IV:

Asan and Pranayam

UNIT-V:

i) Various yog poses and their benefits for mind & body

ii) Regularization of breathing techniques and its effects-Types of pranayam

Reference Books:

1. 'Yogic Asanas for Group Tarining-Part-I": Janardan Swami Yogabhyasi Mandal, Nagpur.
2. "Rajayoga or conquering the Internal Nature" by Swami Vivekananda, Advaita Ashrama (Publication Department), Kolkata.

M. Tech I & II SEMESTERS	L	T	P	C
	2	-	-	2
24AC XM08 :: PERSONALITY DEVELOPMENT THROUGH LIFE ENLIGHTENMENT SKILLS (Audit Course - I & II)				

Course Objectives:

- To learn to achieve the highest goal happily
- To become a person with stable mind, pleasing personality and determination
- To awaken wisdom in students

Course Outcomes:

Upon the successful completion of this course, the students will be able to:

CO1: Understand their Personality and achieve their highest Goals of Life. **(K2)**

CO2: Learn to build Positive Attitude, Self-Motivation, enhancing Self-Esteem and Emotional Intelligence **(K2)**

CO3: Analyze and Develop Time management, Team management, Work ethics, Good manners and personal and professional Etiquettes **(K3)**

CO4: Learn the verses of Bhagwad Geeta with respect to Wisdom / Virtue / Professionalism **(K2)**

CO5: Know the knowledge of Neetishatakam will help in developing versatile personality of students **(K2)**

Syllabus:

UNIT-I:

Neetisatakam-Holistic development of personality

- Verses- 19,20,21,22 (wisdom)
- Verses- 29,31,32 (pride & heroism)
- Verses- 26,28,63,65 (virtue)

UNIT-II:

Neetisatakam-Holistic development of personality

- Verses- 52,53,59 (dont's)
- Verses- 71,73,75,78 (do's)

UNIT-III:

Approach to day to day work and duties.

- Shrimad Bhagwad Geeta: Chapter 2-Verses 41, 47,48,
- Chapter 3-Verses 13, 21, 27, 35, Chapter 6-Verses 5,13,17, 23, 35,
- Chapter 18-Verses 45, 46, 48.

UNIT-IV:

Statements of basic knowledge.

- Shrimad Bhagwad Geeta: Chapter2-Verses 56, 62, 68
- Chapter 12 -Verses 13, 14, 15, 16,17, 18
- Personality of Role model. Shrimad Bhagwad Geeta:

UNIT-V:

- Chapter2-Verses 17, Chapter 3-Verses 36,37,42,
- Chapter 4-Verses 18, 38,39
- Chapter18 – Verses 37,38,63

Reference Books:

1. "Srimad Bhagavad Gita" by Swami Swarupananda Advaita Ashram (Publication Department), Kolkata.
2. Bhartrihari's Three Satakam (Niti-sringar-vairagya) by P.Gopinath, Rashtriya Sanskrit Sansthanam, New Delhi.