UNIVERSAL
COLLEGE OF ENGINEERING &TECHNOLOGY
(AUTONOMOUS)

Accredited by NAAC with B++ | Certified by ISO 9001-2015

Established by The Diocese of Guntur Society-Guntur | Approved by AICTE-New Delhi | Affiliated to JNTU-Kakinada

College Code: NF

EAPCET, ECET PGECET, ICET: UNIV

CELEBRATING 15 YEARS EXECELLENCE

2024 UR24 Regulations

PG ENGINEERING CURRICULUM

M.Tech-Structural Engineering-Regular

Dokiparru(Village), Medikonduru(Mandal)
Guntur(Dst) - 522 438, AP, INDIA

ucetguntur@gmail.com, +91 95505 35373
https://www.ucet.edu.in, 0863 2291231

UR24 Regulations

M.Tech-Structural Engineering-Regular

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

I N D E X

UR24 Regulations

M.Tech-Structural Engineering - Regular

ACADEMIC REGULATIONS

I. UR24 Academic Regulations for M. Tech-Regular

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

Applicable for the students of M. Tech (Regular) Course from the Academic Year 2024-25 onwards. The M. Tech Degree of Jawaharlal Nehru Technological University Kakinada shall be conferred on candidates who are admitted to the program and who fulfill all the requirements for the award of the Degree.

1.0 Eligibility for Admissions

Admission to the above program shall be made subject to eligibility, qualification and specialization as prescribed by the University from time to time.

Admissions shall be made on the basis of merit/rank obtained by the candidates at the qualifying Entrance Test conducted by the University or on the basis of any other order of merit as approved by the University, subject to reservations as laid down by the Govt. from time to time.

2.0 Award of M. Tech Degree

A student shall be declared eligible for the award of the M. Tech Degree, if he pursues acourse of study in not less than two and not more than four academic years.

The student shall register for all 68 credits and secure all the 68 credits.

The minimum instruction days in each semester are 90.

3.0 Programme of Study

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

1. M.Tech- Structural Engineering
2. M.Tech- Computer Science & Engineering

as approved by AICTE/ University from time to time.

The Departments offering M. Tech Programmes with specializations are noted below:

1. Civil Engineering	M.Tech. - Structural Engineering Regular
2. Computer Science & Engineering	M.Tech - Computer Science & Engineering Regular

4.0 Attendance

A student shall be eligible to write University examinations if he acquires a minimum of 75% of attendance in aggregate of all the subjects/courses, and with minimum 50% in each and every course including practicals.

Condonation of shortage of attendance in aggregate up to 10% (65% and above and below 75%) in each semester shall be granted by the College Academic Committee.

Shortage of Attendance below 65% in aggregate shall not be condoned and not eligible to write their end semester examination of that class.

Students whose shortage of attendance is not condoned in any semester are not eligibleto write their end semester examination of that class.

A prescribed fee shall be payable towards condonation of shortage of attendance.
A student shall not be promoted to the next semester unless, he satisfies the attendance requirement of the present semester, as applicable. They may seek re-admission into thatsemester when offered next. If any candidate fulfills the attendance requirement in the present semester, he shall not be eligible for re-admission into the same class.

5.0 Evaluation

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

For the theory subjects 75 marks shall be awarded based on the performance in the End Semester Examination and 25 marks shall be awarded based on the Internal Evaluation. The internal evaluation shall be made based on the average of the marks secured in the two Mid Term-Examinations conducted-one in the middle of the Semester and the other immediately after the completion of instruction. Each mid term examination shall be conducted for a total duration of 120 minutes with 4 questions (without choice) each question for 10 marks, and it will be reduced to 25 marks. End semester examination is conducted for 75 marks for all FIVE (5) questions (one question from one unit) to be answered (either or).

For practical subjects, 75 marks shall be awarded based on the performance in the End Semester Examinations and 25 marks shall be awarded based on the day-to-day performance as Internal Marks. The internal evaluation based on the day to day work-5 marks, record- 5 marks and the remaining 15 marks to be awarded by conducting an internal laboratory test. The end examination shall be conducted by the examiners, with a breakup marks of Procedure-20, Experimentation-30, Results-10, Viva-voce-15.

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 100 marks. A candidate has to secure a minimum of 50% of marksto be declared successful.

A candidate shall be deemed to have secured the minimum academic requirement in a subject if he secures a minimum of 40% of marks in the End semester Examination and a minimum aggregate of 50% of the total marks in the End Semester Examination and Internal Evaluation taken together. In case the candidate does not secure the minimum academic requirement in any subject (as specified in 5.4) he has to re-appear for the End semester Examination in that subject. A candidate shall be given one chance to re-register for each subject provided the internal marks secured by a candidate are less than 50% and has failed in the end examination. In such a case, the candidate must re-register for the subject(s) and secure the required minimum attendance. The candidate's attendance in the re-registered subject(s) shall be calculated separately to decide upon his eligibility for writing the end examination in those subject(s). In the event of the student taking

another chance, his internal marks and end examination marks obtained in the previous attempt shall stands cancelled. For re- registration the candidates have to apply to the University through the college by paying the requisite fees and get approval from the University 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 subject(s), he shall not be permitted to write the End Examination in that subject. He shall again re-register the subject when next offered.

Laboratory examination for M. Tech. courses must be conducted with two Examiners, oneof them being the Laboratory Class Teacher or teacher of the respective college and the second examiner shall be appointed by the University from the panel of examiners submitted by the respective college.

6.0 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.

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

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.

After satisfying 6.2, a candidate has to submit, in consultation with his project supervisor, the title, objective and plan of action of his project work for approval. The student can initiate the Project work, only after obtaining the approval from the Project Review Committee (PRC).

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 examinewhether 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.

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

A candidate shall submit his status report in two stages to the PRC, at least with a gap of3 months between them.

The work on the project shall be initiated at the beginning of the II year 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.

Three copies of the Project Thesis certified by the supervisor shall be submitted to the College/School/Institute.

The thesis shall be adjudicated by one examiner selected by the University. For this, thePrincipal of the College shall submit a panel of 5 examiners, eminent in that field, with the help of the guide concerned and head of the department.

If the report of the examiner is not favourable, the candidate shall revise and resubmit the Thesis, in the time frame as decided by the PRC. If the report of the examiner is unfavorable again, the thesis shall be summarily rejected. The candidate has to re- register for the project and complete the project within the stipulated time after takingthe approval from the University.
The Head of the Department shall coordinate and make arrangements for the conduct of Viva-Voce examination.

If the report of the examiner is favourable, Viva-Voce examination shall be conducted by a board consisting of the Supervisor, Head of the Department and the examiner who adjudicated the Thesis. The Board shall jointly report the candidate's work for amaximum of 100 marks as one of the following:

a. Excellent
b. Good
c. Satisfactory
d. Unsatisfactory

If the report of the Viva-Voce is unsatisfactory (i.e., < 50 marks), 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 University.

7.0 Cumulative Grade Point Average (CGPA)

Marks Range Theory/ Laboratory (Max – 100)	Marks Range Mini Project/ Project Workor Dissertation (Max – 100)	LetterGrade	Level	Grade Point
≥ 90	≥ 90	O	Outstanding	10
≥80 to <90	≥80 to <90	S	Excellent	9
≥70 to <80	≥70 to <80	A	Very Good	8
≥60 to <70	≥60 to <70	B	Good	7
≥50 to <60	≥50 to <60	C	Fair	6
≥40 to <50	≥40 to <50	D	Satisfactory	5
<40	<40	F	Fail	0
			Absent	0

7.1 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 undergoneby a student, i.e
- SGPA (Si) = $\sum$ (Ci X Gi) / $\sum$ Ci
- Where Ci is the number of credits of the ith course and Gi is the grade point scored by the student in the ith course.

7.2 Computation of CGPA

- The CGPA is also calculated in the same manner taking into account allthe courses undergone by a student over all the semester of a Programme, i.e.
- CGPA = ∑ (Ci X Si) / ∑ Ci
- Where Si is the SGPA of the i^{th} semester and Ci is the total number ofcredits in that semester.
- The SGPA and CGPA shall be rounded off to 2 decimal points andreported in the transcripts.
- Equivalent Percentage = (CGPA – 0.75) x 10

8.0 Award of Degree and Class

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

Class Awarded	CGPA to be secured	
First Class with Distinction	≥ 7.75	From the CGPA Secured from 68 Credits.
First Class	≥ 6.75	
Second Class	≥ 5.75 to < 6.75	
Pass Class	≥ 4.75 to < 5.75	

The Grades secured, Grade points and Credits obtained will be shown separately in the memorandum of marks.

9.0 Withholding of Results

If the student is involved in indiscipline/malpractices/court cases, the result of the studentwill be withheld.

10.0 Transitory Regulations

Discontinued or detained candidates are eligible for re-admission into same or equivalent subjects at a time as and when offered.

The candidate who fails in any subject will be given two chances to pass the same subject; otherwise, he has to identify an equivalent subject as per R16 academic regulations.

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 Vice-Chancellor is final.

The UCET 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 University.

11. Malpractices Rules
Disciplinary Action for / Improper Conduct in Examinations

S.No.	Nature of Malpractices/ Improper conduct	Punishment
If the candidate:		
1. (a)	Possesses or keeps accessible in examination hall, any paper, note book, programmable calculators, Cell phones, pager, palm computers or any other form of material concerned with or related to the subject of the examination (theory or practical) in which he is appearing but has not made use of (material shall include any marks on the body of the candidate which can be used as an aid in the subject of the examination)	Expulsion from the examination hall and cancellation of the performance in that subject only.
(b)	Gives assistance or guidance or receives it from any other candidate orally or by any other body language methods or communicates through cell phones with any candidate or persons in or outside the exam hall in respect of any matter.	Expulsion from the examination hall and cancellation of the performance in that subject only of all the candidates involved. In case of an outsider, he will be handed over to the police and a case is registered against him.
2.	Has copied in the examination hall from any paper, book, programmable calculators, palm computers or any other form of material relevant to the subject of the examination (theory or practical) in which the candidate is appearing.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted to appear for the remaining examinations of the subjects of that Semester/ year. The Hall Ticket of the candidate is to be cancelled and sent to the University.
3.	Impersonates any other candidate in connection with the examination.	The candidate who has impersonated shall be expelled from examination hall. The candidate is also debarred and forfeits the seat. The performance of the original candidate who has been impersonated, shall be cancelled in all the subjects of the examination (including practical and project work) already appeared and shall not be allowed to appear for examinations of the remaining subjects of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all end examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat. If the imposter is an outsider, he will be handed over to the police and a case is registered against him.

4.	Smuggles in the Answer book or additional sheet or takes out or arranges to send out the question paper during the examination or answer book or additional sheet, during or after the examination.	Expulsion from the examination hall and cancellation of performance in that subject and all the other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all University examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat.
5.	Uses objectionable, abusive or offensive language in the answer paper or in letters to the examiners or writes to the examiner requesting him to award pass marks.	Cancellation of the performance in that subject.
6.	Refuses to obey the orders of the Chief Superintendent/Assistant Superintendent / any officer on duty or misbehaves or creates disturbance of any kind in and around the examination hall or organizes a walk out or instigates others to walk out, or threatens the officer-in charge or any person on duty in or outside the examination hall of any injury to his person or to any of his relations whether by words, either spoken or written or by signs or by visible representation, assaults the officer- in-charge, or any person on duty in or outside the examination hall or any of his relations, or indulges in any other act of misconduct or mischief which result in damage to or destruction of property in the examination hall or any part of the College campus or engages in any other act which in the opinion of the officer on duty amounts to use of unfair means or misconduct or has the tendency to disrupt the orderly conduct of the examination.	In case of students of the college, they shall be expelled from examination halls and cancellation of their performance in that subject and all other subjectsthe candidate(s) has (have) already appeared and shall not be permitted to appear for the remaining examinations of the subjects of that semester/year. The candidates also are debarred and forfeit their seats. In case of outsiders, they will be handed over to the police and a police case is registered against them.

7.	Leaves the exam hall taking away answer script or intentionally tears of the script or any part thereof inside or outside the examination hall.	Expulsion from the examination hall and cancellation of performance in that subject and all the other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/ year. The candidate is also debarred for two consecutive semesters from class work and all end examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat.
8.	Possess any lethal weapon or firearm in the examination hall.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred and forfeits the seat.
9.	If student of the college, who is not a candidate for the particular examination or any person not connected with the college indulges in any malpractice or improper conduct mentioned in clause 6 to 8.	Student of the colleges expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred and forfeits the seat. Person(s) who do not belong to the College will be handed over to police and, a police case will be registered against them.
10.	Comes in a drunken condition to the examination hall.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year.
11.	Copying detected on the basis of internal evidence, such as, during valuation or during special scrutiny.	Cancellation of the performance in that subject and all other subjects the candidate has appeared including practical examinations and project work of that semester/ year examinations.

12.	If any malpractice is detected which is not covered in the above clauses 1 to 11 shall be reported to the University for further action to award suitable punishment.	

Malpractices identified by squad or special invigilators

1. Punishments to the candidates as per the above guidelines.
2. Punishment for institutions: (if the squad reports that the college is also involved inencouraging malpractices)
   i. A show cause notice shall be issued to the college.
   ii. Impose a suitable fine on the college.
   iii. Shifting the examination centre from the college to another college for aspecific period of not less than one year.

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UR24 Regulations

M.Tech-Structural Engineering Regular

COURSE STRUCTURE & SYLLABUS

II. UR24 M.Tech-Structural Engineering Course Structure: Semester wise Courses

I Year I-Semester

S. No.	*Course Name*	*Course Category*	*L*	*T*	*P*	*C*
1	Theory of Elasticity	PC	3	0	--	3
2	Structural Dynamics	PC	3	0	--	3
3	**Program Elective-I**	PE	3	0	--	3
	A. Matrix Analysis of Structures					
	B. Analytical & Numerical Methods for Structural Engineering					
	C. Design of RCC Foundations					
4	**Program Elective-II**	PE	3	0	--	3
	A. Bridge Engineering					
	B. Repair and Rehabilitation of Structures					
	C. Advanced Reinforced Concrete Design					
5	Advanced Concrete Technology	PC	2	0	0	2
6	Advanced Concrete TechnologyLaboratory	LAB	-	--	4	2
7	Advanced Structural Engineering Laboratory	LAB	-	--	4	2
8	Audit Course-1	AUDIT	2	0	0	0
Total Credits / Marks						**18**

I Year II–Semester

S. No.	*Course Name*	*Course Category*	*L*	*T*	*P*	*C*
1	Finite Element Methods in Structural Engineering	PC	3	0	--	3
2	Theory of Plates and Shells	PC	3	0	--	3
3	Program Elective-III	PE	3	0	--	3
	A. Stability of Structures					
	B. Advanced Steel Design					
	C. Analysis of Offshore Structures					
4	**Program Elective-IV**	PE	3	0	--	3
	A. Earthquake Resistant Design of B. Buildings					
	C. Precast and Prefabricated Structures					
	D. Earth Retaining Structures					
5	Computer Aided Design Laboratory	PC	--	--	4	2
6	Structural Design laboratory	LAB	--	--	4	2
7	Mini Project With Seminar	LAB	0	0	4	2
8	Audit Course-2	AUDIT	2	0	0	0
Total Credits / Marks						**18**

II Year I–Semester

S. No.	*Course Name*	*Course Category*	*L*	*T*	*P*	*C*
1	**Program Elective-V** / MOOCS**	PE	3	0	--	3
	A. Design of Pre-stressed Concrete structures					
	B. Structural Health Monitoring					
	C. Industrial Structures					
2	**Open Elective** / MOOCS**	PE	3	0	--	3
	A. Operations Research **B.** Construction Management **C.** Green Technology					
3	Dissertation Phase-I / Industrial Project (To be continued andEvaluated next Semester)*	PJ	--	--	20	10
Total Credits / Marks						**16**

* Evaluated and displayed in 4th Semester marks list

** Students Going for Industrial Project / Thesis will complete these courses through MOOCS. Students can also choose SWAYAM or NPTEL with a 12 weeks course duration in PG level with 3 credits, but the chosen subject should not be covered in their M. Tech Course.

II Year II-Semester

Sl No.	*Course Name*	*Course Category*	*L*	*T*	*P*	*C*
1	Project/ Dissertation Phase-II (Continued from III Semester)	PJ	0	0	32	16
Total Credits / Marks						**16**

Audit Course-1 & 2

1. English for Research Paper Writing
2. Disaster Management
3. Sanskrit for Technical Knowledge
4. Value Education
5. Constitution of India
6. Pedagogy Studies
7. Stress Management by Yoga
8. Personality Development through Life Enlightenment Skills.

UR24 M.Tech-Structural Engineering-Course wise Syllabus

I Year - I Semester	Program Core	L	T	P	C
		3	0	0	3
THEORY OF ELASTICITY					

Course Outcomes: At the end of the course, the student will be able to

CO1 Know the definition of stress and deformation and how to determine the components of the stress and strain tensors.
CO2 Apply the conditions of compatibility and equations of equilibrium.
CO3 Understand how to express the mechanical characteristics of materials, constitutive equations and generalized Hook law.
CO4 Use the equilibrium equations stated by the displacements and compatibility conditions stated by stresses
CO5 Understand index notation of equations, tensor and matrix notation and define state of plane stress, state of plane strain
CO6 Be able to analyze real problem and to formulate the conditions of theory of elasticity Applications
CO7 Determine the boundary restrictions in calculations. Solve the basic problems of the theory of elasticity by using Airy function expressed as bi- harmonic function Detailed 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 Prismatic 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

References:

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

I Year - I Semester	Program Core	L	T	P	C
		3	0	0	3
STRUCTURAL DYNAMICS					

Course Outcomes: At the end of the course, the student will be able to

CO1 Understand the response of structural systems to dynamic loads
CO2 Realize the behavior and response of linear and nonlinear SDOF and MDOF structures with various dynamic loading
CO3 Understand the behavior and response of MDOF structures with various dynamic loading.
CO4 Possess the ability to find out suitable solution for continuous system
CO5 Understand the behavior of structures subjected to dynamic loads under free vibration
CO6 Understand the behavior of structures subjected to dynamic loads Harmonic excitation and earthquake load

UNIT I

Theory of vibrations: Introduction - Elements of vibratory system - Degrees of Freedom - Continuous System - Lumped mass idealization - Oscillatory motion - Simple Harmonic motion - Victorian representation of S.H.M. - Free vibrations of single degree of freedom system - undamped and damped vibrations - critical damping - Logarithmic decrement - Forced vibration of SDOF systems - Harmonic excitation - Vibration Isolation -Dynamic magnification factor – Phase angle.

UNIT II

Introduction to Structural Dynamics : Fundamental objectives of dynamic analysis -Types of prescribed loading - Methods of discretization - Formulation of equations of motion by different methods – Direct equilibration using Newton's law of motion / D'Alembert's Principle, Principle of virtual work and Hamilton principle.

Single Degree of Freedom Systems : Formulation and solution of the equation of motion - Free vibration response - Response to Harmonic, Periodic, Impulsive and general dynamic loadings - Duhamel integral.

UNIT III

Multi Degree of Freedom Systems : Selection of the degrees of Freedom - Evaluation of structural property matrices - Formulation of the MDOF equations of motion -Undamped free vibrations - Solutions of Eigen value problem for natural frequencies and mode shapes - Analysis of Dynamic response – Normal co-ordinates - Uncoupled equations of motion - Orthogonal properties of normal modes - Mode superposition procedure.

UNIT IV

Practical Vibration Analysis: Introduction - Stodola method - Fundamental mode analysis - Analysis of second and higher modes - Holzer method - Basic procedure.

Continuous Systems: Introduction - Flexural vibrations of beams - Elementary case – Derivation of governing differential equation of motion - Analysis of undamped free vibrations of beams in flexure - Natural frequencies and mode-shapes of simple beams with different end conditions - Principles of application to continuous beams.

UNIT V

Introduction to Earthquake Analysis: Deterministic Earthquake Response: Systems on Rigid Foundations -Types of Earthquake Excitations – Lumped SDOF Elastic Systems, Translational

Excitations -Generalized coordinate -SDOF Elastic Systems, Translational Excitations, Linear Static Method – Analysis for obtaining response of multi storied RC Building.

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. Manika Selvam, Dhanpat Rai Publishers

References:

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

I Year - I Semester	Program Elective-I	L	T	P	C
		3	0	0	3
A. MATRIX ANALYSIS OF STRUCTURES					

Course Outcomes: At the end of the course, the student 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

CO2 Perform structural analysis using the stiffness method.

CO3 Solve multiple degree of freedom two and three dimensional problems involving trusses, beams, frames and plane stress

CO4 Understand basic finite element analysis

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 – coordinate 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

Analysis of plane truss - continuous beams with and without settlement - plane frame including side sway single storey, single – bay and gable frame by flexibility method using system approach

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, Mc Graw Hil Education

References:

1. Indeterminate Structural analysis, C K Wang, Amazon Publications
2. Analysis of Tall buildings by force – displacement – Method M. Smolira Mc. Graw Hill.
3. Foundation Analysis and design, J.E. Bowls, 5e, Amazon Publications.
4. Matrix Analysis of Framed Structures 3e-William Weaver, Jr, James M. Gere, Van Nostrand Reinhold, Newyork
5. Matrix Methods of Structural Analysis Madhu B. Kanchi, Wiley Publications.
6. Indeterminate Structural Analysis by K. U. Muthu, IK International Publishing house

I Year - I Semester	Program Elective-I	L	T	P	C
		3	0	0	3
B. ANALYTICAL & NUMERICAL METHODS FOR STRUCTURAL ENGINEERING					

Course Outcomes: At the end of the course, the student will be able to

CO1 Understand the fundamentals of the theory of elasticity
CO2 Implement the principles and techniques of photo elastic measurement
CO3 Obtain the principles and techniques of strain gage measurement
CO4 Adopt the principles and techniques of moiré analysis
CO5 Apply the principles and techniques of holographic interferometer
CO6 Apply the principles and techniques of brittle coating analysis Understand the fundamentals of the theory of elasticity

UNIT I
Transform Methods- Laplace transform methods for one-dimensional wave equation - Displacements in a long string - Longitudinal vibration of an elastic bar - Fourier transforms methods for one-dimensional heat conduction problems in infinite and semi-infinite rod

UNIT II
Elliptic Equations-Laplace equation - Properties of harmonic functions - Fourier transform methods for Laplace equation
Calculus Of Variations- Variation and its properties - Euler's equation - Functionals dependent on first and higher order derivatives - Functionals dependent on functions of several independent variables - Some applications - Direct methods - Ritz and Kantorovich methods

UNIT III
Integral Equations- Fredholm and Volterra integral equations - Relation between differential and integral equations - Green's function -Fredholm equation with separable kernel - Iterative method for solving equations of second kind

UNIT IV
Finite Difference and their Applications: Introduction- Differentiation formulas by Interpolating parabolas – Backward and forward and central differences- Derivation of Differentiation formulas using Taylor series- Boundary conditions- Beam deflection – Solution of characteristic value problems - Richardson's extrapolation - Use of unevenly spaced pivotal points- Integration formulae by interpolating parabolas- Numerical solution to spatial differential equations – Application to Simply Supported Beams, Columns & rectangular Plates.

UNIT V
Numerical Differentiation: Difference methods based on undetermined coefficients- optimum choice of step length– Partial differentiation. Numerical Integration: Method based on interpolation-method based on undetermined coefficient – Gauss – Lagrange interpolation method- Radaua integration method- composite integration method – Double integration using Trapezoidal and Simpson's method – New Marks Method and Application to Beams – Calculations of Slopes & Deflections.

Text Books:
1. Introduction to Partial Differential Equations, Sankara Rao. K, , PHI, New Delhi, 1995
2. Numerical Methods For Scientific and Engineering Computations. M. K. Jain-S. R. K. Iyengar

– R. K. Jain, New Age International (p) Ltd., Publishers.

References:

1. Differential Equations and Calculus of Variations Elsgolts. L, Mir Publishers, Moscow, 1966.
2. Fundamentals of Mathematical Statistics Gupta. S.C, & Kapoor. V.K, Sultan Chand & Sons, Reprint 1999.
3. Higher Engineering Maths for Engg. And Sciences Venkataraman. M. K, National Publishing Company, Chennai.
4. Numerical Methods for Engineering Problems N. Krishna Raju, K.U. Muthu Macmillan Publishers.
5. Elements of Partial Differential Equations, Sneddon. I.N, Mc Graw Hill, 1986.
6. Computer based numerical analysis by Dr. M. Shanta Kumar, Khanna Book publishers New Delhi.

I Year - I Semester	Program Elective-I	L	T	P	C
		3	0	0	3
C. DESIGN OF REINFORCED CONCRETE FOUNDATIONS					

Course Outcomes: At the end of the course, the student will be able to

CO1 Attain the perception of site investigation to select suitable type of foundation based on soil category
CO2 Capable of ensuring design concepts of shallow foundation
CO3 Can be efficient in selecting suitable type of pile for different soil stratum and in evaluation of group capacity by formulation
CO4 Design different types of well foundation

UNIT I

Foundation Structures & Design of Centrally Loaded Isolated Footings and Column Pedestals – Introduction, Rigid and Flexible Foundations, Loads and their Effects, Design Requirements, Geotechnical Design, Empirical and Exact Methods of Analysis of foundations, Design Loads for Foundations, Recommended Approach to Structural Design of Foundations.

Introduction, General Procedure for Design, Design of Square Footing of Uniform Depth (Pad Footing), Design of sloped Rectangular Footings, Design Procedure, Detailing of Steel, Design of Rectangular Pad Footings, Design of Plain Concrete Footings, Design of Pedestals, Design Calculation for Pedestals.

UNIT II

Wall Footings – Introduction Simple Plain Concrete Wall Footings, Reinforced Concrete Continuous Strip Wall Footings, Design of continuous Strip Wall Footings, Design for Longitudinal Steel, R.C. T Beam Footings in Shrinkable Soils, Foundations of Partition Wall in Ground Floors, Summary.

Strip Footings Under Several Columns – Introduction, Design Procedure for Equally loaded and Equally Spaced Columns, Analysis of Continuous Strip Footing for Unsymmetric Loading, Analysis of Strip Footing with Unsymmetrical Loads, Detailing of Members.

UNIT III

Raft Foundations – Introduction, Rigid and Flexible Foundations, common Types of Rafts, Deflection Requirements of Beams and Slabs in Rafts, General considerations in Design of Rigid Rafts, Types of Loadings and Choice of Rafts, Record of Contact Pressures Measured Under Rafts, Modern Theoretical Analysis.

Design of Flat Slab Rafts-Mat Foundations – Introduction, Components of Flat Slabs, Preliminary Planning of Flat Slab Rafts, Analysis of Flat Slab by Direct Design Method, Method of Analysis, Values for Longitudinal Distribution and Transverse, Redistribution, Shear in Flat Slabs, Bending of Columns in flat Slabs, Limitations of Direct Design Method for Mats, Detailing of Steel, Design of Edge Beam in Flat Slabs.

Beam and Slab Rafts – Introduction, Planning of the Raft, Action of the Raft, Approximate Dimensioning of the Raft, Design of the Beam and Slab Raft under Uniform Pressure, Structural Analysis for the Main Slab, Design of Secondary and Main Beams, Analysis by Winkler Model, Detailing of Steel.

UNIT IV

Combined Piled Raft Foundations (CPRF) – Introduction, Types and uses of Piled Rafts, , Interaction of Pile and Raft, Ultimate Capacity and Settlement of Piles, Estimation of Settlement

of Raft in Soils, Allowable Maximum and Differential Settlement in Buildings, Design of CPRF System, conceptual Method of Design, Conceptual Method of Analysis, Distribution of Piles in the Rafts, Theoretical Methods of Analysis.
Circular and Annular Rafts – Introduction, Positioning of chimney Load on Annular Raft, Forces Acting on Annular Rafts, Pressures Under Dead Load and Moment, Methods of Analysis, Conventional Analysis of Annular Rafts, Analysis of Ring Beams Under circular Layout of Columns, Analysis of Ring Beam Transmitting Column Load to Annular Rafts, Detailing of Annular Raft Under Columns of a Circular Water Tank.

UNIT V
Under-reamed Pile Foundations – Introduction, Safe Loads on Under-reamed Piles, Design of Under-reamed Pile Foundation for Load Bearing Walls of Buildings, Design of Grade Beams, Design of Under-reamed Piles Under Columns of Buildings, Use of Under-reamed Piles for Expansive Soils.
Design of cantilever and Basement Retaining Walls – Introduction, Earth Pressure and Rigid Walls, Calculation of Earth Pressure on Retaining Walls, Design of Rigid Walls, Design of Ordinary R.C. cantilever Walls, Design of cantilever Walls without Toe, Design of Basement Walls, Calculation of Earth Pressures in Clays, Design of Free Standing Basement Walls.

Text Books:
1. Design of Reinforced Concrete Foundations by P. C Varghese, PHI Learning Private Limited., New Delhi.
2. Swamy saran

References:
1. Design of Reinforced Concrete Structures by N. Subramaniam- Oxford University.
2. Reinforced Concrete Design by Unnikrishna Pillai and Devdas Menon, Tata Mc Graw Hill.

I Year - I Semester	Program Elective-II	L	T	P	C
		3	0	0	3
A. BRIDGE ENGINEERING					

Course Outcomes: At the end of the course, the student will be able to

CO1 Design theories for super structure and substructure of bridges
CO2 Design Culvert, R.C.C T Beam Bridge.
CO3 Understand the behavior of continuous bridges, box girder bridges.
C04 Possess the knowledge to design pre-stressed concrete bridges.
C05 Design Railway bridges, Plate girder bridges, different types of bearings, abutments, piers and various types of foundations for Bridges

UNIT I
Concrete Bridges: Introduction-Types of Bridges-Economic span length-Types of loading-Dead load-live load-Impact Effect-Centrifugal force-wind loads-Lateral loads-Longitudinal forces-Seismic loads- Frictional resistance of expansion bearings-Secondary Stresses-Temperature Effect-Erection Forces and effects-Width of roadway and footway-General Design Requirements.

UNIT II
Pigeaud's method-design of longitudinal girders- Guyon-Messonet method- Hendry Jaegar method- Courbon's theory. (Ref: IRC-21), voided slabs,
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- T-Beam bridges.

UNIT III
Box Culverts- Single Cell Box Culvert – Design Loads, Design Moments, Shears and Thrusts. Design of Critical sections.

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

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
3. Essentials of Bridge Engineering- Jhonson Victor D, 7e, Oxford IBH Publications

References:
1. Bridge Deck Behavior- E.C. Hambly 2e- CRC Press
2. Concrete Bridge Design and Practice- V.K. Raina, Tata McGraw- Hill Publishing Company Limited
3. Bridge Engineering by S. Ponnuswamy, Mc Grawhill Publications
4. IRC 6- 2016 Standard Specifications and Code of Practice for Road bridges
5. IRC 112-2011 Code of Practice for Concrete Road Bridges

I Year - I Semester	Program Elective-II	L	T	P	C
		3	0	0	3
B. REPAIR AND REHABILITATION OF STRUCTURES					

Course Outcomes: At the end of the course, the student will be able to

CO1 Recognize the mechanisms of degradation of concrete structures and to design durable concrete structures.
CO2 Conduct field monitoring and non-destructive evaluation of concrete structures.
CO3 Design and suggest repair strategies for deteriorated concrete structures including repairing with composites.
CO4 Understand the methods of strengthening methods for concrete structures.
CO5 Assessment of the serviceability and residual life span of concrete structures by Visual inspection and in situ tests
CO6 Evaluation of causes and mechanism of damage.
C07 Evaluation of actual capacity of the concrete structure Maintenance strategies.

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 debonding- CDC 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 concretes-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
3. Rehabilitation of Concrete Structures- B. Vidivelli, Standard Publishers Distributors
4. Concrete Bridge Practice Construction Maintenance & Rehabilitation- V.K. Raina, Shroff Publishers and Distributors.

References:

1. Concrete Technology Theory and Practice- M.S. Shetty, S Chand and Company
2. Concrete Repair and Maintenance illustrated- Peter H Emmons
3. Concrete Chemical Theory and Applications- Santa Kumar A.R., Indian Society for Construction Engineering and Technology, Madras
4. Handbook on Repair and Rehabilitation of RC Buildings published by CPWD, Delhi

I Year - I Semester	Program Elective-II	L	T	P	C
		3	0	0	3
C. ADVANCED REINFORCED CONCRETE DESIGN					

Course Outcomes: At the end of the course, the student will be able to

CO1 Estimate the deflection of Concrete beams and slabs
CO2 Estimate crack width and its affects
CO3 Design flat slabs, bunkers, silos and chimneys
CO4 Understand the thermal effect on concrete members

UNIT I
Limit Analysis of R C Structures: Rotation of a plastic hinge, Redistribution of moments, moment rotation characteristics of RC member, I.S. code provisions, loading pattern, Bending Moment Envelop, Application for Fixed Beams and Continuous Beams. Inelastic Analysis of Slabs, Moment Redistribution.

UNIT II
Yield line analysis for slabs: Yield line criterion – Virtual work and equilibrium methods of analysis – For square circular, Rectangular, Triangular and Hexagonal with simple and continuous end conditions.

UNIT III
Ribbed slabs: Analysis of the Slabs for Moment and Shears, Ultimate Moment of Resistance, Design for shear, Deflection, Arrangement of Reinforcements.
Flat slabs: Direct design method – Distribution of moments in column strips and middle strip-moment and shear transfer from slabs to columns – Shear in Flat slabs-Check for one way and two way shears-Introduction to Equivalent frame method. Limitations of Direct design method, Distribution of moments in column strips and middle strip sketch showing reinforcement details.

UNIT IV
Design of Reinforced Concrete Deep Beams & Corbels: Steps of Designing Deep Beams, Design by IS 456. Checking for Local Failures, Detailing of Deep Beams, Analysis of Forces in a Corbels, Design of Procedure of Corbels, Design of Nibs. Detailing of reinforcement.

UNIT V
Design of Slender Columns – Slenderness limits, Methods of Design of Slender Columns, Additional Moment Method, Procedure for Design of Slender Columns. Detailing of reinforcement.
Eccentrically Loaded columns- development of interaction Diagrams

Text Books:
1. Advanced Reinforced Concrete Design, by P.C. Varghese Prentice Hall India Limited
2. Design of Reinforced Concrete Structures by N.Subramanian, Oxford University Press.
3. Reinforced Concrete Design, by S. Unnikrishna Pillai & Devdas Menon Tata Mc. Graw-Hill Publishing Company Ltd. New Delhi 2010.

Reference:
1. Limit State Theory and Design of Reinforced Concrete S. R. Karve and V.L Shah. Standard Publishers

2. Reinforced concrete structural elements – behavior, Analysis and design by P. Purushotham, Tata Mc.Graw-Hill, 1994.
3. Design of concrete structures – Arthus H. Nilson, David Darwin, and Chorles W. Dolar, Tata Mc. Graw-Hill, 3rd Edition, 2005.
4. Reinforced Concrete design by Kennath Leet, Tata Mc. Graw-Hill International, editions, 2nd
5. edition, 1991.
6. Design Reinforced Concrete Foundations P.C. Varghese Prentice Hall of INDIA Private Ltd.
7. IS 456-2000 Plain and Reinforced concrete book of Practice.
8. SP 16- Design Aids for Reinforced Concrete to IS 456
9. SP 34 - Hand Book as Concrete Reinforcement and retaining

I Year - I Semester	Program Core	L	T	P	C
		2	0	0	2
ADVANCED CONCRETE TECHNOLOGY					

Course Objectives:
To impart knowledge on concrete making materials, concrete mix design for proportioning and their testing.

Course Outcomes:
The learner will be able to design concrete mixes of different grades and also use the special concretes.

UNIT I
Concrete Making Materials : Cement – Bogus Compounds – Hydration Process – Types of Cement – Aggregates – Gradation Charts – Combined Aggregate – Alakali Silica Reaction – Admixtures – Chemical and Mineral Admixtures. Bureau of Indian Standards (BIS) Provisions.

UNIT II
Fresh And Hardened Concrete: Fresh Concrete – workability tests on Concrete – Setting Times of Fresh Concrete – Segregation and bleeding.
Hardened Concrete : Abrams Law, Gel space ratios, Maturity concept – Stress strain Behaviour – Creep and Shrinkage – Durability Tests on Concrete – Non Destructive Testing of Concrete. BIS Provisions.

UNIT III
High Strength Concrete – Microstructure – Manufacturing and Properties – Design of HSC Using Erintroy Shaklok method – Ultra High Strength Concrete.
High Performance Concrete – Requirements and Properties of High Performance Concrete – Design Considerations. BIS Provisions.

UNIT IV
Special Concretes: Self Compacting concrete, Polymer Concrete, Fibre Reinforced Concrete – Reactive Powder Concrete – Requirements and Guidelines – Advantages and Applications.
Concrete Mix Design: Quality Control – Quality Assurance – Quality Audit - Mix Design Method – BIS Method – IS.10262 – 2019 Concrete Mix proportion guidelines. DOE Method– Light Weight Concrete, Self Compacting Concrete.

UNIT V
Form work – materials – structural requests – form work systems – connections – specifications – design of form work – shores – removal for forms - shores – reshoring – failure of form work.

Text Books:
1. Properties of Concrete by A. M. Neville, ELBS publications Oct 1996.
2. Concrete Technology by A. R. Santhakumar, 2nd Edition, Oxford University Press.
3. Concrete Technology by M.S. Shetty, S.Chand & Co 2009.

References:
1. Concrete: Micro Structure, Properties and Materials by P. K. Mehta and P. J. Monteiro,. Mc. Graw-Hill Publishing Company Ltd. New Delhi
2. Design of Concrete Mixes by N. Krishna Raju, CBS Publications, 2000.
3. Special Structural concretes by Rafat Siddique, Galgotia Publications 2000. 4. IS 10262-2009
4. Relevant BIS Codes

I Year - I Semester	Laboratory	L	T	P	C
		0	0	4	2
ADVANCED CONCRETE TECHNOLOGY LABORATORY					

Course Outcomes: At the end of the course, the student will be able to able to

CO1 Conduct various laboratory tests on Cement, Aggregates.
C02 Know strain measurement.
C03 Non-destructive testing.
C04 Chemical analysis on concrete and Aggregate and Sand.

List of Experiments:

1. Study on Water / Cement Ratios Vs Workability of different concretes
2. Study on Water / Cement Ratios Vs Strength of different concretes
3. Study of variation of Coarse Aggregate to Fine Aggregates on Workability
4. Study of variation of Coarse Aggregate to Fine Aggregates on Strength
5. Strain measurement - Electrical resistance strain gauges
6. Non destructive testing- Impact Hammer test, UPV test
7. Qualifications tests on Self compaction concrete- L Box , J Box , U box and Slump tests

Note: A minimum of five experiments from the above set have to be conducted

I Year - I Semester	Laboratory	L	T	P	C
		0	0	4	2
ADVANCED STRUCTURAL ENGINEERING LABORATORY					

Course Outcomes: At the end of the course, the student will be able to

CO1 conduct various laboratory tests on Cement, Aggregates.
C02 Know strain measurement.
C03 Non-destructive testing.
C04 Chemical analysis on concrete and Aggregate and Sand.

List of Experiments:

1. Study on Deflection and Cracks on a Under Reinforced Over Reinforced and Balanced Sections.
2. Study on Performance of RCC Beams designed for Bending and failing in Shear.
3. Study on Performance of RCC Beams designed for Shear and failing in Bending.
4. Study on Performance of RCC One way slabs.
5. Study on Performance of RCC Two way slabs with simply supported edge conditions.
6. Study on Performance of RCC Two way slabs with fixed edge conditions.
7. Calculation of Young's Modulus of Elasticity of Concrete.
8. Extraction and Study of Concrete Core samples from pavements.

Note: *A minimum of five experiments from the above set have to be conducted as demonstration to entire class.*

I Year - II Semester	Program Core	L	T	P	C
		3	0	0	3
FINITE ELEMENT METHODS IN STRUCTURAL ENGINEERING					

Course Outcomes: At the end of the course, the student will be able to

CO1 Develop finite element formulations of 1 degree of freedom problems and solve them
CO2 Understand any Finite Element software to perform stress, thermal and modal analysis
CO3 Compute the stiffness matrices of different elements and system
CO4 Interpret displacements, strains and stress resultants

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 axi-symmetric problems- Derivation of CST and LST stiffness matrix and equations-treatment of body and surface forces-Finite Element solution for plane stress and axi-symmetric problems- comparison of CST and LST elements –convergence of solution- interpretation of stresses.

UNIT V
Iso-parametric Formulation: Iso-parametric bar element- plane bilinear Iso-parametric 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. A first course in the Finite Element Method – Daryl L. Logan, Thomson Publications.
2. Concepts and applications of Finite Element Analysis – Robert D. Cook, Michael E Plesha, John Wiley & Sons Publications
3. Fundamental Finite Element Analysis and Applications: with Mathematica and Matlab Computations, Bhatti, M.A. Wiley Publications

References:
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.

I Year - II Semester	Program Core	L	T	P	C
		3	0	0	3
THEORY OF PLATES AND SHELLS					

Course Outcomes: At the end of the course, the student will be able to

CO1 Have a knowledge about various plate theories due to bending
CO2 Gain the knowledge of Navier's solution, Levy's solution and solve for the rectangular and square plates
CO3 Analyze circular plates with various boundary conditions.
CO4 Focus on the finite difference method of solving plate problems.
CO5 Ability to realize the potential energy principle and find the solution of rectangular plates for various loadings
CO6 Understand the behaviour of folded plates and shells.

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 2e –S. Timoshenko and S. Woinowsky Krieger, McGraw-Hill book company, INC, New York.
2. Reinforced Concrete Shells and Folded Plates by P.C. Varghese, Prentice Hall India Publications
3. Analysis of Thin Concrete Shells by K. Chandrasekhara, New Age International (P) Ltd

References:
1. Theory and Analysis of Elastic Plates and Shells by J. N. Reddy, CRS Press
2. A Text Book of Shell Analysis – Bairagi, K, Khanna Publisher, New Delhi.
3. Design and Construction of Concrete Shell Roofs – Ramaswamy, G.S, Mc Graw Hill, New York.

I Year - II Semester	Program Elective-III	L	T	P	C
		3	0	0	3
A. STABILITY OF STRUCTURES					

Course Outcomes: At the end of the course, the student will be able to

CO1 Analyze different types of structural instabilities
CO2 Execute and work out the inelastic buckling using various methodologies.
CO3 Examine the behaviour of beam columns and frames with and without side sway using classical and stiffness methods
CO4 To be well versed in the lateral buckling, torsional buckling, Flexural torsional buckling of various beams and non-circular sections.

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. Theory of Stability of Structures by Alexander ChaJes.
2. Theory of Elastic Stability by S. P. Timshenko & J.M. Gere-Mc Graw Hill Publications
3. Theory of Elastic Stability by Manikaselvam

References:
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.

I Year - II Semester	Program Elective-III	L	T	P	C
		3	0	0	3
B. ADVANCED STEEL DESIGN					

Course Objective:
To impart knowledge on behavior and design of various connections, industrial and steel girders.

Course Outcome:
The learner will be able to design different steel structures.

UNIT I
Simple Connections – Riveted, Bolted Pinned And Welded Connections: Riveted Connections – Bolted Connections –Load Transfer Mechanism – Failure of Bolted Joints – Specifications for Bolted Joints – Bearing – Type Connections – Tensile Strength of Plate – Strength and Efficiency of the Joint – Combined Shear and Tension – Slip-Critical connections – Prying Action – Combined Shear and Tension for Slip-Critical Connections. Design of Groove Welds - Design of Fillet Welds – Design of Intermittent Fillet Welds – Failure of Welds.

UNIT II
Plastic Analysis: Introduction – Plastic Theory – Plastic neutral Axis plastic moment, Elastic & Plastic Section moduli - shape factors plastic Hinge – Fundamental condition conditions in plastic analysis, methods of plastic analysis – collapse load – simply supported, propped cantilever beam, fixed beams continuous beams, portal frame single bay single storey portal frame at different level subjected to vertical and horizontal loads.

UNIT III
Eccentric And Moment Connections: Introduction – Beams – Column Connections – Connections Subjected to Eccentric Shear – Bolted Framed Connections –Bolted Seat Connections – Bolted Bracket Connections. Bolted Moment Connections – Welded Framed Connections- Welded Bracket Connections – Moment Resistant Connections.

UNIT IV
Analysis And Design Of Industrial Buildings: Dead loads, live loads and wind loads on roofs. Design wind speed and pressure, wind pressure on roofs; wind effect on cladding and louvers; Design of angular roof truss, tubular truss, truss for a railway platform. Design of purlins for roofs, design of built up purlins, design of knee braced trusses and stanchions. Design of bracings.

UNIT V
Design Of Steel Truss Girder Bridges: Types of truss bridges, component parts of a truss bridge, economic Proportions of trusses, self weight of truss girders, design of bridge Compression members, tension members; wind load on truss girder Bridges; wind effect on top lateral bracing; bottom lateral bracing; portal Bracing; sway bracing Design of Lacing.

Text Books:
1. Limit State Design of Steel Structures S.K. Duggal Mc Graw Hill Education Private Ltd. New Delhi.
2. Design of steel structures by N. Subramanian, Oxford University Press
3. Design Steel Structures Volume-II, Ramachandra & Vivendra Gehlot, Scientific Publishes Journals Department..

References:

1. Design of Steel Structures. P. Dayaratnam, S. Chand, Edition 2011-12.
2. Design of Steel Structures Galyord & Gaylord, Tata Mc Graw Hill, Education, Edition 2012.
3. Indian Standard Code – IS – 800-2007.
4. Indian Standard Code – IS – 875 – Part III - 2015

I Year - II Semester	Program Elective-III	L	T	P	C
		3	0	0	3
C. ANALYSIS OF OFFSHORE STRUCTURES					

Course Outcomes: At the end of the course, the student will be able to

CO1 Perform concept development of offshore structure
CO2 Find the wave force on vertical cylinder
CO3 Perform static and dynamic analysis of fixed offshore structure

UNIT I
Introduction to different types of offshore structures, Concept of fixed, compliant and floating structures, Law of floatation, fluid pressure and centre of pressure, estimation of centre of gravity, hydrostatic particulars, stability criteria of floating bodies, and motions of a floating body.

UNIT II
Conservation mass and momentum, Euler equation, Bernoullis Equation, Potential flow, Classification of waves, small amplitude or Linear Airy's theory, dispersion relationship, water particle kinematics, wave energy.

UNIT III
Wave force estimation- Wave force on small bodies-Morison equation, Estimation of wave force on a vertical cylinder, Force due to current, Effect of marine growth on vertical cylinders.

UNIT IV
Wave force on large bodies-Froude-krylov theory, Diffraction theory.

UNIT V
Static and dynamic analysis of fixed offshore structures.

Text Books:
1. Graff, W. J., Introduction to Offshore Structures, Gulf Publ. Co.1981.
2. Dawson, T. H., Offshore Structural Engineering, Prentice Hall, 1983.

References:
1. Hand book of offshore Engineering, Vol I, Subrata Chakrabarti, Offshore Structure Analysis, Inc., Plainfield, Illinois, USA.
2. API RP 2A., Planning, Designing and Constructing Fixed Offshore Platforms, API.
3. McClelland, B & Reifel, M. D., Planning & Design of fixed Offshore Platforms, Van Nostrand, 1986.

I Year - II Semester	Program Elective-IV	L	T	P	C
		3	0	0	3
A. EARTHQUAKE RESISTANT DESIGN OF BUILDINGS					

Course Outcomes: At the end of the course, the student will be able to

CO1 To learn the fundamentals of seismology and basic earthquake mechanisms, tectonics types of ground motion, and propagation of ground motion.
CO2 Understand qualitative and quantitative representations of earthquake magnitude
CO3 Determine the natural frequency of a single degree of freedom dynamic system for given mass, stiffness and damping properties.
CO4 Determine the maximum dynamic response of an elastic vibrating structure to a given forcing function
CO5 Learn the fundamentals of building code based structural design
CO6 Determine the static design base shear based on the type of structural system, irregularity, location and occupancy.
CO7 Distribute the static base shear to the structure based on vertical distribution of mass horizontal distribution of mass, and centers of rigidity.
CO8 Recognize special conditions such as irregular buildings, building separation, P-delta

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 – Non- structural 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. Earthquake Resistant Design of Structures Pankaj Agarwal and Manish ShriKhande, Prentice
2. Hall of India, 2007, New Delhi.
3. Earthquake Resistant Design of Structures- S.K. Duggal, Oxford Publications

References:

1. Seismic design of reinforced concrete and masonry buildings by Paulay and Priestley
2. Earthquake Resistant Design and Risk Reduction- David Dowrick
3. IS 4326 -1998: Earthquake Resistant Design and Construction of Buildings
4. IS 1893 (Part 1 to 5)- 2016: General Provisions and Building
5. IS 4928–1993: Code of practice for Earthquake Resistant Design and Construction of Buildings
6. IS 13920-2016: Code of Practice for Ductile Detailing of Reinforced Concrete Structures subjected to Seismic Forces
7. IS 13935-1993: Guidelines for Repair and Seismic Strengthening of Building

I Year - II Semester	Program Elective-IV	L	T	P	C
		3	0	0	3
B. PRECAST AND PREFABRICATED STRUCTURES					

Course Outcomes: At the end of the course, the student will be able to:

CO1 Analyze the prefabricated load carrying members
CO2 Analyze the production technology of prefabrication
CO3 Design and detailing of precast UNIT for factories
CO4 Design single storied simple frames

UNIT I
Need for prefabrication – General Principles of Prefabrication - Comparison with monolithic construction, types of prefabrication, site and plant prefabrication, economy of prefabrication, modular coordination, standardization – Materials – Modular coordination – Systems – Production – Transportation – Erection.

UNIT II
Prefabricated Load Carrying Members-Planning for components of prefabricated structures, disuniting of structures, design of simple rectangular beams and I-beams, handling and erection stresses, elimination of erection stresses, beams, columns, symmetric frames. Behaviour of structural components – Large panel constructions – Construction of roof and floor slabs – Wall panels – Columns – Shear walls.

UNIT III
Joints - Joints for different structural connections, effective sealing of joints for water proofing, provisions for non-structural fastenings, expansion joints in precast construction.

UNIT IV
Production Technology - Choice of production setup, manufacturing methods, stationary and mobile production, planning of production setup, storage of precast elements, dimensional tolerances, acceleration of concrete hardening. Hoisting Technology - Equipment for hoisting and erection, techniques for erection of different types of members like beams, slabs, wall panels and columns, vacuum lifting pads.

UNIT V
Applications - Designing and detailing of precast UNIT for factory structures, purlins, principal rafters, roof trusses, lattice girders, gable frames, singe span single storied simple frames, single storied buildings, slabs, beams and columns. Progressive collapse – Code provisions – Equivalent design loads for considering abnormal effects such as earthquakes, cyclones, etc., - Importance of avoidance of progressive collapse.

Text Books:
1. Precast Concrete Structures- Kim S Elliott, CRC Press
2. CBRI, Building materials and components, India, 1990
3. Gerostiza C.Z., Hendrikson C. and Rehat D.R., Knowledge based process planning for construction and manufacturing, Academic Press Inc., 1994
4. Koncz T., Manual of precast concrete construction, Vols. I, II and III, Bauverlag, GMBH, 1971.

References:

1. Structural design manual, Precast concrete connection details, Society for the studies in the use of precast concrete, Netherland Betor Verlag, 1978.
2. Mokk. L, (1964), Prefabricated Concrete for Industrial and Public Structures, Publishing House of the Hungarian Academy of Sciences, Budapest.

I Year - II Semester	Program Elective-IV	L	T	P	C
		3	0	0	3
C. EARTH RETAINING STRUCTURES					

Course Outcomes: At the end of the course, the student will be able to

CO1 Quantify the lateral earth pressures associated with different earth systems
CO2 Evaluate the mechanical properties of geo-synthetics used for soil reinforcement
CO3 Identify the merits and demerits of different earth retaining systems.
CO4 Select the most technically appropriate type of retaining wall for the application from a thorough knowledge of available systems
CO5 Design of retaining structures using appropriate design methods, factors of safety, earth pressure diagrams and field verification methods
CO6 Aware of current guidelines regarding the design of earth retaining structures.
CO7 Design retaining structures considering both external and internal stability aspects

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 – Rowe's moment reduction method – Location of anchors and Design of Anchorage system.

UNIT IV

Soil reinforcement – Reinforced earth - Different components – their functions – Design principles of reinforced earth retaining walls.

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

References:

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

I Year - II Semester	**Laboratory**	L	T	P	C
		0	0	4	2
COMPUTER AIDED DESIGN LABORATORY					

Course Outcomes: At the end of the course, the student will be able to

CO1 Develop Computer Programs for Analysis and Design of various Structural Elements
CO2 Use different Structural Engineering software's to solve various civil Engineering programs

Analysis and Design using STADD, STADD FOUNDATION, ETABS, ANSYS

1. Programming for beams subject to different loading
2. Analysis and Design of reinforced concrete multistoried building
3. Analysis of plane and space truss
4. Analysis of plane and space frame
5. Determination of mode shapes and frequencies of tall buildings using lumped mass (stick model) approximation

Note: A minimum of four from the above set have to be conducted.

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

I Year - II Semester	**Laboratory**	L	T	P	C
		0	0	4	2
STRUCTURAL DESIGN LABORATORY					

Course Outcomes: At the end of the course, the student will be able to

CO1 Develop Computer Programs for Analysis and Design of various Structural Elements
CO2 Use different Structural Engineering software's to solve various civil Engineering programs

Analysis and Design using STADD, STADD FOUNDATION, ETABS, ANSYS

1. Wind analysis on tall structure
2. Analysis of pre stressed concrete bridge girder
3. Analysis of Cylindrical shell
4. Analysis of Bridge Pier and Abutment
5. Dynamic Analysis of Multistory structure

Note: A minimum of Four from the above set have to be conducted.

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

I Year - II Semester		L	T	P	C
		0	0	4	2
SEMINAR					

Course Outcomes: At the end of the course, the student will be able to

CO1 Collect research material on some topic and to summaries it report and give to present the same

I Year - II Semester		L	T	P	C
DESIGN PROJECT					

Course Outcomes: At the end of the course, the student will be able to

CO1 Analyze, design and prepare a report on Special Design topic related to Structural Engineering

I Year - II Semester		L	T	P	C
DISSERTATION / THESIS					

Course Outcomes: At the end of the course, the student will be able to

CO1 Identifying the topic after thorough review of literature on chosen topic and Can able to do the Project either Experimental Work or analytical Work

II Year - I Semester	Program Elective-V	L	T	P	C
		3	0	0	3
A. DESIGN OF PRE-STRESSED CONCRETE STRUCTURES					

Course Outcomes: At the end of the course, the student will be able to

CO1 Explain the principle, types and systems of pre-stressing and analyze the deflections.
CO2 Determine the flexural strength and design the flexural members, end blocks.
CO3 Analyze the statically indeterminate structures and design the continuous beam.
C04 Design the tension and compression members and apply it for design of piles.
C05 Analyze the stress, deflections, flexural and shear strength and apply it for the design of bridges.
C06 Analyze the Composite construction of Pre-stressed and in-situ concrete.

UNIT I

Introduction – Pre-stressing Systems – Pretensioning Systems – Postensioning Systems – High Strength Steel and Concrete - Analysis of Prestress - Resultant Stresses at a Section – Pressure Line or Thrust Line – Concept of Load Balancing - Losses of Prestress – Loss Due to Elastic Deformation of Concrete – Shrinkage of Concrete – Creep – Relaxation of Stress in Steel – Friction – Anchorage Slip.

UNIT II

DEFLECTIONS OF PRESTRESSED CONCRETE MEMBERS : Importance of Control of Deflections – Factors Influencing Deflection – Short-term Deflections of Uncracked Members – Prediction of Long-time Deflections – Deflections of Cracked Members – Requirements of IS 1343-2012.

Ultimate Flexural Strength of Beams: Introduction, Flexural theory using first principles – Simplified Methods – Ultimate Moment of Resistance of untensioned Steel.

UNIT III

COMPOSITE CONSTRUCTIONS: Introduction, Advantages, Types of Composite Construction, Analysis of Composite beams- Differential shrinkage- Ultimate Flexural and shear strength of composite sections- Deflection of Composite Beams. Design of Composite sections.

UNIT IV

PRESTRESSED CONCRETE SLABS: Types Of Prestressed Concrete Floor Slabs- Design of Prestressed Concrete One Way and Two Way Slabs.

Prestressed Concrete Pipes and Poles : Circular prestressing- Types of Prestressed Concrete Pipes- Design of Prestressed Concrete Pipes - Prestressed Concrete Poles.

UNIT V

CONTINUOUS BEAMS: Advantage of Continuous Members – Effect of Prestressing Inderterminate Structures – Methods of Achieving Continuity – Methods of Analysis of Secondary Moments – Concordant Cable Profile – Guyon's Theorem. Redistribution of moments in a continuous beam.

Anchorage Zone Stresses in Beams : Introduction, Stress distribution in End Block – Anchorage zone stresses –Magnel's method- Guyon's Method - Anchorage zone Reinforcement.

Text Books:

1. Prestressed Concrete, 6e by N. Krishna Raju, Mc Graw Hill Publishers

2. Prestressed Concrete by K. U.Muthu, PHI Learning Pvt Limited

References:

1. Prestressed Concrete Analysis and Design, Antone E. Naaman 2e, Techno Press 3000
2. Design of Prestressed Concrete- T. Y. Lin, Ned H. Burns 3e, Wiley Publications
3. Design of prestressed Concrete by E.G. Nawy
4. Prestressed Concrete by N. Rajagopalan, Narosa Publishing
5. IS1343 2012 Prestressed concrete Code of Practice

II Year - I Semester	Program Elective-V	L	T	P	C
		3	0	0	3
B. STRUCTURAL HEALTH MONITORING					

Course Outcomes: At the end of the course, the student will be able to

CO1 Diagnose the distress in the structure by understanding the causes and factors
CO2 Assess the health of structure using static field methods.
CO3 Assess the health of structure using dynamic field tests
C04 Carryout repairs and rehabilitation measures of the structure

UNIT I
Structural Health: Factors affecting Health of Structures, Causes of Distress, Regular Maintenance
Structural Audit: Assessment of Health of Structure, Collapse and Investigation, Investigation Management, SHM Procedures

UNIT II
Structural Health Monitoring: Concept, Various Measures, Structural Safety in Alteration
Structural Audit: Assessment of Health of Structure, Collapse and Investigation, Investigation Management, SHM Procedures

UNIT- III
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 IV
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.

References:
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.

II Year - I Semester	Program Elective-V	L	T	P	C
		3	0	0	3
C. INDUSTRIAL STRUCTURES					

Course Outcomes: At the end of the course, the student will be able to

CO1 Plan the functional requirements of structural systems for various industries.
CO2 Get an idea about the materials used and design of industrial structural elements.
CO3 Realize the basic concepts and design of power plant structures.
CO4 Design power transmission structures.
CO5 Possess the ability to understand the design concepts of Chimneys, bunkers and silos

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 Pre Engineered Buildings

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. Handbook on Machine Foundations by P. Srinivasulu and C. V. Vaidyanathan, Structural Engineering Research Center
2. Tall Chimneys- Design and Construction by S. N. Manohar Tata Mc Grawhill Publishing Company

References:
1. Transmission Line Structures by S. S. Murthy and A. R. Santakumar McGraw Hill
2. SP 32: 1986, Handbook on functional requirements of Industrial buildings
3. Design of steel structures by N. Subramanian

II Year - I Semester	Open Elective	L	T	P	C
		3	0	0	3
A. OPERATIONS RESEARCH					

Course Outcomes: At the end of the course, the student will be able to

- Formulate a linear programming problem for given problem and solve this problem by using Simplex techniques
- Apply the dynamic programming to solve problems of discreet and continuous variables
- Apply the concept of non-linear programming for solving the problems involving non- linear constraints
- Carry out sensitivity analysis
- Model the real world problem and simulate it

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.

References:

1. Kanthi Swarup, P.K. Gupta and Man Mohan, Operations Research, 14 th Edition, Sultan Chand and Sons, New Delhi, 2008.
2. S. D. Sharma, Operations Research, Kedar Nath and Ram Nath, Meerut,2008.
3. H.A. Taha, Operations Research, An Introduction, PHI, 2008
4. H.M. Wagner, Principles of Operations Research, PHI, Delhi, 1982.
5. J.C. Pant, Introduction to Optimisation: Operations Research, Jain Brothers, Delhi, 2008
6. Hitler Libermann Operations Research: McGraw Hill Pub. 2009
7. Pannerselvam, Operations Research: Prentice Hall of India 2010
8. Harvey M Wagner, Principles of Operations Research: Prentice Hall of India 2010

II Year - I Semester	Open Elective	L	T	P	C
		3	0	0	3
B. CONSTRUCTION MANAGEMENT					

Course Outcome:

- Able to plan, coordination, and control of a project from beginning to completion.
- Adopting the most effect method for meeting the requirement in order to produce a functionally and financially viable project.

UNIT I

Management process- Roles. Management theories. Social responsibilities. Planning and strategic management. Strategy implementation. Decision making: tools and techniques – Organizational structure. Human resource management- motivation performance- leadership.

UNIT II

Classification of Construction projects, Construction stages, Resources- Functions of Construction Management and its Applications. Preliminary Planning- Collection of Data- Contract Planning – Scientific Methods of Management: Network Techniques in construction management - Bar chart, Gant chart, CPM, PERT- Cost & Time optimization.

UNIT III

Resource planning - planning for manpower, materials, costs, equipment. Labour -Scheduling - Forms of scheduling - Resource allocation. budget and budgetary control methods

UNIT IV

Contract - types of contract, contract document, and specification, important conditions of contract – tender and tender document - Deposits by the contractor - Arbitration. negotiation - M.Book - Muster roll -stores.

UNIT V

Management Information System - Labour Regulations: Social Security - welfare Legislation - Laws relating to Wages, Bonus and Industrial disputes, Labour Administration - Insurance and Safety Regulations - Workmen's Compensation Act -other labour Laws - Safety in construction: legal and financial aspects of accidents in construction. occupational and safety hazard assessment. Human factors in safety. Legal and financial aspects of accidents in construction. Occupational and safety hazard assessment.

References:

1. Ghalot, P.S., Dhir, D.M., Construction Planning and Management, Wiley Eastern Limited,1992.
2. Chitkara,K.K., Construction Project Management, Tata McGraw Hill Publishing Co, Ltd., New Delhi,998.
3. Punmia,B,C., Project Planning and Control with PERT and CPM, Laxmi Publications, New Delhi,1987.
4. Sengupta, B. &Guha, H, Construction Management and Planning by: Tata McGraw-hill publications.

II Year - I Semester	Open Elective	L	T	P	C
		3	0	0	3
C. GREEN TESCHNOLOGY					

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

- Enlist different concepts of green technologies in a project
- Understand the principles of Energy efficient technologies
- Estimate the carbon credits of various activities
- Recognize the benefits of green fuels with respect to sustainable development.

UNIT I

Introduction: Green Technology – definition- Importance – Historical evolution – advantages and disadvantages of green technologies-factors affecting green technologies- Role of Industry, Government and Institutions – Industrial Ecology – role of industrial ecology in green technology.

Cleaner Production (CP): Definition – Importance – Historical evolution - Principles of Cleaner Production–Benefits–Promotion – Barriers – Role of Industry.

UNIT II

Cleaner Production Project Development and Implementation:

Government and Institutions – clean development mechanism, reuse, recovery, recycle, raw material substitution-Wealth from waste, case studies.

Overview of CP Assessment Steps and Skills, Process Flow Diagram, Material Balance, CP Option Generation – Technical and Environmental Feasibility analysis – Economic valuation of alternatives - Total Cost Analysis – CP Financing – Preparing a Program Plan – Measuring Progress- ISO 14000.

UNIT III

Pollution Prevention and Cleaner Production Awareness Plan – Waste audit – Environmental Statement, carbon credit, carbon sequestration, carbon trading, Life Cycle Assessment - Elements of LCA – Life Cycle Costing – Eco Labelling.

UNIT IV

Availability and need of conventional energy resources, major environmental problems related to the conventional energy resources, future possibilities of energy need and availability. Non-conventional energy sources: Solar Energy-solar energy conversion technologies and devices, their principles, working and application.

UNIT V

Green Fuels – Definition-benefits and challenges – comparison of green fuels with conventional fossil fuels with reference to environmental, economical and social impacts- public policies and market-driven initiatives.

Biomass energy: Concept of biomass energy utilization, types of biomass energy, conversion processes, Wind Energy, energy conversion technologies, their principles, equipment and suitability in Indian context; tidal and geothermal energy.

References:

1. ‘Pollution Prevention: Fundamentals and Practice’ by Paul L Bishop (2000), McGraw Hill

International.
2. ‘Cleaner Production Audit’ by Prasad Modak, C.Visvanathan and MandarParasnis (1995), Environmental System Reviews, No.38, Asian Institute of Technology, Bangkok
3. ‘Non-conventional Energy Sources’ by Rai G.D.
4. ‘Energy, The Solar Hydrogen Alternative’ by Bokris J.O.
5. Waste Energy Utilization Technology’ by Kiang Y. H.
6. ‘Solar Energy’ by Sukhatme S.P.
7. ‘Pollution Prevention and Abatement Handbook – Towards Cleaner Production’ by World Bank Group (1998), World Bank and UNEP, Washington D.C.
8. ‘Handbook of Organic Waste Conversion’ by Bewik M.W.M.

II Year - I Semester		L	T	P	C
SEMINAR					

Course Outcomes: At the end of the course, the student will be able to

CO1 Collect research material on some topic and to summaries it report and give to present the same

II Year - I Semester		L	T	P	C
DESIGN PROJECT					

Course Outcomes: At the end of the course, the student will be able to

CO1 Analyse, design and prepare a report on Special Design topic related to Structural Engineering

II Year - I Semester		L	T	P	C
		0	0	32	16
DISSERTATION / THESIS					

Course Outcomes: At the end of the course, the student will be able to

CO1 Identifying the topic after thorough review of literature on chosen topic and Can able to do the Project either Experimental Work or analytical Work

	Audit Course 1 and 2	L	T	P	C
1. ENGLISH FOR RESEARCH PAPER WRITING					

Course objectives: Students will be able to:

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

Syllabus		
UNIT	**CONTENTS**	**HOURS**
1	Planning and Preparation, Word Order, Breaking up long sentences, Structuring Paragraphs and Sentences, Being Concise and Removing Redundancy, Avoiding Ambiguity and Vagueness	4
2	Clarifying Who Did What, Highlighting Your Findings, Hedging and Criticising, Paraphrasing and Plagiarism, Sections of a Paper, Abstracts. Introduction	4
3	Review of the Literature, Methods, Results, Discussion, Conclusions, The Final Check.	4
4	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.	4
5	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.	4
6	Useful phrases, how to ensure paper is as good as it could possibly be the first- time submission.	4

Suggested Studies:

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

	Audit Course 1 and 2	L	T	P	C
2. DISASTER MANAGEMENT					

Course Objectives: Students will be able to:

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

Syllabus		
UNIT	**CONTENTS**	**HOURS**
1	**Introduction** Disaster: Definition, Factors And Significance; Difference Between Hazard And Disaster; Natural And Manmade Disasters: Difference, Nature, Types And Magnitude.	4
2	**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.	4
3	**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	4
4	**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.	4
5	**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.	4
6	**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.	4

Suggested Readings:

1. R. Nishith, Singh AK, "Disaster Management in India: Perspectives, issues and strategies "'New Royal book Company.
2. Sahni, PardeepEt.Al. (Eds.)," Disaster Mitigation Experiences And Reflections", Prentice Hall Of India, New Delhi.
3. Goel S. L. , Disaster Administration And Management Text And Case Studies" ,Deep &Deep Publication Pvt. Ltd., New Delhi.

	Audit Course 1 and 2	L	T	P	C
3. SANSKRIT FOR TECHNICAL KNOWLEDGE					

Course Objectives:

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

Syllabus		
UNIT	**CONTENTS**	**HOURS**
1	Alphabets in Sanskrit, Past/ Present/ Future Tense, Simple Sentences	4
2	Order Introduction of roots Technical information about Sanskrit Literature	4
3	Technical concepts of Engineering-Electrical,	4
4	Technical concepts of Engineering - Mechanical.	4
5	Technical concepts of Engineering - Architecture.	4
6	Technical concepts of Engineering – Mathematics.	4

Suggested Readings:

1. "Abhyaspustakam" – Dr.Vishwas, Samskrita-Bharti Publication, New Delhi
2. "Teach Yourself Sanskrit" Prathama Deeksha-Vempati Kutumbshastri, Rashtriya Sanskrit Sansthanam, New Delhi Publication
3. "India's Glorious Scientific Tradition" Suresh Soni, Ocean books (P) Ltd., New Delhi.

Course Outcome: Students will be able to

1. Understanding basic Sanskrit language
2. Ancient Sanskrit literature about science & technology can be understood
3. Being a logical language will help to develop logic in students

	Audit Course 1 and 2	L	T	P	C
4. VALUE EDUCATION					

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

Syllabus		
UNIT	**CONTENTS**	**HOURS**
1	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	4
2	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	4
3	Personality and Behavior Development - Soul and Scientific attitude. Positive Thinking. Integrity and discipline. Punctuality, Love and Kindness. Avoid fault Thinking.	4
4	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	4
5	Character and Competence –Holy books vs Blind faith. Self-management and Good health. Science of reincarnation. Equality, Nonviolence ,Humility, Role of Women.	4
6	All religions and same message. Mind your Mind, Self-control. Honesty, Studying effectively	4

Suggested readings:

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

Course outcomes

Students will be able to 1.Knowledge of self-development

2. Learn the importance of Human values 3.Developing the overall personality

	Audit Course 1 and 2	L	T	P	C
5. CONSTITUTION OF INDIA					

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. To 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. To 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.

Syllabus		
UNIT	**CONTENTS**	**HOURS**
1	**History of Making of the Indian Constitution:** History Drafting Committee, (Composition & Working)	4
2	**Philosophy of the Indian Constitution:** Preamble Salient Features	4
3	**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.	4
4	**Organs of Governance:** Parliament Composition Qualifications and Disqualifications Powers and Functions Executive President Governor Council of Ministers Judiciary, Appointment and Transfer of Judges, Qualifications Powers and Functions	4
5	**Local Administration:** District's Administration head: Role and Importance, Municipalities: Introduction, Mayor and role of Elected Representative, CE of Municipal Corporation. Pachayati raj: Introduction, PRI: ZilaPachayat. Elected officials and their roles, CEO ZilaPachayat: Position and role. Block level: Organizational Hierarchy (Different departments), Village level: Role of Elected and Appointed officials, Importance of grass root democracy	4

6	**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.	4

Suggested Readings:

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

Course Outcomes: Students will be able to:

1. Discuss the growth of the demand for civil rights in India for the bulk of Indians before the arrival of Gandhi in Indian politics.
2. Discuss the intellectual origins of the framework of argument that informed the conceptualization of social reforms leading to revolution in India.
3. Discuss the circumstances surrounding the foundation of the Congress Socialist Party [CSP] under the leadership of Jawaharlal Nehru and the eventual failure of the proposal of direct elections through adult suffrage in the Indian Constitution.
4. Discuss the passage of the Hindu Code Bill of 1956.

	Audit Course 1 and 2	L	T	P	C
6. PEDAGOGY STUDIES					

Course Objectives: Students will be able to:

1. Review existing evidence on the review topic to inform programme design and policy making undertaken by the DfID, other agencies and researchers.
2. Identify critical evidence gaps to guide the development.

Syllabus		
UNIT	**CONTENTS**	**HOURS**
1	**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.	4
2	Thematic overview: Pedagogical practices are being used by teachers in formal and informal classrooms in developing countries. Curriculum, Teacher education.	4
3	Evidence on the effectiveness of pedagogical practices Methodology for the in depth stage: quality assessment of included studies. How can teacher education (curriculum and practicum) and the school curriculum and guidance materials best support effective pedagogy?	4
4	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.	4
5	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	4
6	**Research gaps and future directions** Research design Contexts Pedagogy Teacher education Curriculum and assessment Dissemination and research impact.	4

Suggested Readings:

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.

Course Outcomes: Students will be able to understand:

1. What pedagogical practices are being used by teachers in formal and informal classrooms in developing countries?
2. What is the evidence on the effectiveness of these pedagogical practices, in what conditions, and with what population of learners?
3. How can teacher education (curriculum and practicum) and the school curriculum and guidance materials best support effective pedagogy?

	Audit Course 1 and 2	L	T	P	C
7. STRESS MANAGEMENT BY YOGA					

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

Syllabus		
UNIT	**CONTENTS**	**HOURS**
1	Definitions of Eight parts of yog. (Ashtanga)	4
2	Yam and Niyam. Do`s and Don't's in life. Ahinsa, satya, astheya, bramhacharya and aparigraha	4
3	Yam and Niyam. Do`s and Don't's in life. Shaucha, santosh, tapa, swadhyay, ishwarpranidhan	4
4	Asan and Pranayam Various yog poses and their benefits for mind & body	4
5	Regularization of breathing techniques and its effects-Types of pranayam	4

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

Course Outcomes: Students will be able to:
1. Develop healthy mind in a healthy body thus improving social health also
2. Improve efficiency

	Audit Course 1 and 2	L	T	P	C
8. PERSONALITY DEVELOPMENT THROUGH LIFE ENLIGHTENMENT SKILLS					

Course Objectives:

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

Syllabus		
UNIT	**CONTENTS**	**HOURS**
1	Neetisatakam-Holistic development of personality Verses- 19,20,21,22 (wisdom) Verses- 29,31,32 (pride & heroism) Verses- 26,28,63,65 (virtue)	4
2	Neetisatakam-Holistic development of personality Verses- 52,53,59 (dont's) Verses- 71,73,75,78 (do's)	4
3	Approach to day to day work and duties. Shrimad Bhagwad Geeta : Chapter 2-Verses 41, 47,48,	4
4	Chapter 3-Verses 13, 21, 27, 35, Chapter 6-Verses 5,13,17, 23, 35, Chapter 18-Verses 45, 46, 48.	4
5	Statements of basic knowledge. Shrimad Bhagwad Geeta: Chapter2-Verses 56, 62, 68 Chapter 12 -Verses 13, 14, 15, 16,17, 18	4
6	Personality of Role model. Shrimad Bhagwad Geeta: Chapter2-Verses 17, Chapter 3-Verses 36,37,42, Chapter 4-Verses 18, 38,39 Chapter18 – Verses 37,38,63	4

Suggested Readings:

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.

Course Outcomes: Students will be able to

1. Study of Shrimad-Bhagwad-Geeta will help the student in developing his personality and achieve the highest goal in life
2. The person who has studied Geeta will lead the nation and mankind to peace and prosperity
3. Study of Neetishatakam will help in developing versatile personality of students.

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ucetguntur@gmail.com, 95505 35373
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