



NRI INSTITUTE OF TECHNOLOGY

(An Autonomous Institution Permanently Affiliated to JNTUK, Kakinada)
(Accredited by NAAC with "A" Grade and ISO 9001:2015 Certified Institution)
POTHAVARAPPADU (V), (VIA) NUNNA, AGIRIPALLI (M), PIN – 521 212

DEPARTMENT OF CIVIL ENGINEERING

STRUCTURE FOR FIRST YEAR B.TECH PROGRAMME

I YEAR I SEMESTER

Sl. No	Course Code	Title of the Course	Scheme of Instruction (Periods Per Week)				Scheme of Examination (Maximum Marks)			No. of Credits
			L	T	P	Total	CIA	SEA	Total	
1	20A1100101	Professional Communication	3	0	0	3	30	70	100	3
2	20A1100201	Engineering Mathematics-1	3	1	0	4	30	70	100	4
3	20A1100202	Engg. Physics	3	0	0	3	30	70	100	3
4	20A1101401	Engg. Drawing	1	0	4	5	30	70	100	3
5	20A1102301	BASIC ELECTRICAL ENGINEERING	3	0	0	3	30	70	100	3
6	20A1100291	Engg. Physics Lab	0	0	3	3	15	35	50	1.5
7	20A1101391	Basics of Civil & Electrical Engg. Work Shop (Lab)	0	0	3	3	15	35	50	1.5
Total			13	1	10	24	180	420	600	19

I YEAR II SEMESTER

Sl. No	Course Code	Title of the Course	Scheme of Instruction (Periods Per Week)				Scheme of Examination (Maximum Marks)			No. of Credits
			L	T	P	Total	CIA	SEA	Total	
1	20A1200201	Engineering Mathematics-II	3	0	0	3	30	70	100	3
2	20A1200204	Engg. Chemistry	3	0	0	3	30	70	100	3
3	20A1201401	Theory of Mechanics	3	0	0	3	30	70	100	3
4	20A1205301	Programming and Problem Solving with C	3	0	0	3	30	70	100	3
5	20A1201402	Building Material & Concrete technology	3	0	0	3	30	70	100	3
6	20A1200293	Engg. Chemistry Lab	0	0	3	3	15	35	50	1.5
7	20A1205391	Programming and Problem Solving with C Lab	0	0	3	3	15	35	50	1.5
8	20A1201491	Building Planning and Computer Aided Building Drawing	0	0	3	3	15	35	50	1.5
9	20A1200191	Communicative English IAB	0	0	3	3	15	35	50	1.5
10	20A1200801	Environmental Sciences	2	0	0	2	30	70*	100	0
Total			17	0	12	29	240	560	800	21

* Internal Evaluation

L - LECTURE T - TUTORIAL P - PRACTICAL

CIA - Continuous Internal Assessment SEA - Semester End Assessment



NRI INSTITUTE OF TECHNOLOGY

(An Autonomous Institution Permanently Affiliated to JNTUK, Kakinada)
(Accredited by NAAC with "A" Grade and ISO 9001:2015 Certified Institution)
POTHAVARAPPADU (V), (VIA) NUNNA, AGIRIPALLI (M), PIN – 521 212

**20A1100101: PROFESSIONAL COMMUNICATION
(Common to CE,EEE,ME,ECE,CSE,IT,AIIML and DS)**

Lecture – Tutorial:	3-1 Hours	Internal Marks:	30									
Credits	3	External Marks:	70									
Prerequisites: None												
Course Objectives												
<ol style="list-style-type: none"> To strengthen the lexical ability of the students in different contexts. To expose the students to various sub-skills and strategies of reading and writing – summarizing and paraphrasing. To help the students develop effective writing skills through paragraph writing. To train the students in fundamentals of grammar required to equip them with fluent English. To enable the students to think critically by exposing them to different socio-cultural contexts through various literary texts. 												
Course Outcomes												
Upon successful completion of the course, the student will be able to:												
CO1	Build the grammatical structures accurately in their real-time situations in either spoken or written form.											
CO2	Extend their ability to use vocabulary from various texts along with GRE and technical vocabulary in written and spoken communication											
CO3	Comprehend, analyze and evaluate texts critically. Demonstrate effective writing skills in specific forms of written communication (paragraphs, summaries, email and letters.)											
CO4	Apply the strategies of reading various texts and graphs, and describe in prose.											
CO5	Relate human values and professional ethics in their academic, professional and social lives.											
CO6	Summarize the main events of the literary texts, from different socio-cultural contexts, and interpret them critically.											
Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – High)												
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1										1		2
CO2										1		2
CO3										2		2
CO4										1		2
CO5							1	1				2
CO6												2
UNIT I												
<ol style="list-style-type: none"> Text: A Drawer full of happiness from “Infotech English”, Maruthi Publications Reading: Skimming text to get the main idea. Scanning to look for specific pieces of information. Reading for Writing: Paragraph Writing (specific topics) using suitable Cohesive Devices; Linkers, Sign Posts and Transition Signals; Mechanics of Writing - Punctuation, Capital Letters. Vocabulary: Technical vocabulary from across technical branches (20) GRE Vocabulary (20) (Antonyms and Synonyms, Word applications) Verbal Reasoning and Sequencing of Words. Grammar: Content Words and Function Words; Word Forms: Verbs, Nouns, Adjectives and Adverbs; Nouns: Countables and Uncountables; Singular and Plural, Basic Sentence Structures; Simple Question Form - WH- Questions; Word Order in Sentences. Collocations (30 Phrases) 												
UNIT II												
<ol style="list-style-type: none"> Text: Nehru’s letter to his daughter Indira on her birthday from “Infotech English”, Maruthi Publications Reading: Identifying sequence of ideas; recognizing verbal techniques that help to link the ideas in a paragraph together. Reading for Writing: Summarizing - identifying main idea/s and rephrasing what is read; avoiding redundancies and repetitions. Vocabulary: Technical vocabulary from across technical branches (20 words). GRE Vocabulary 												

Analogies (20 words) (Antonyms and Synonyms, Word applications)

5. **Grammar:** Use of Articles and Zero Article; Prepositions; Connectives (25 words)

UNIT III

1. **'Benchmark'** from "**Infotech English**", Maruthi Publications **Text: Stephen Hawking-Positivity**
2. **Reading:** Reading a text in detail by making basic inferences - recognizing and interpreting specific context clues; strategies to use text clues for comprehension. Critical Reading.
3. **Reading for Writing:** Summarizing - Identifying main ideas and Rephrasing what is read; avoiding Redundancies and Repetitions. Letter Writing-types, Format and Principles of Letter Writing. E-mail Etiquette, Writing CVs.
4. **Vocabulary:** Technical vocabulary from across technical branches (20 words). GRE Vocabulary (20 words) (Antonyms and Synonyms, Word applications) Association, Sequencing of Words
5. **Grammar:** Verbs, Phrasal Verbs - Tenses; Subject-Verb Agreement;

UNIT IV

1. **Text: Liking a Tree, Unbowed: Wangari Maathai-biography** from "**Infotech English**", Maruthi Publications
2. **Reading:** Studying the use of graphic elements in texts to convey information, reveal trends / patterns / relationships, communicative process or display complicated data.
3. **Reading for Writing:** Information transfer; describe, compare, contrast, identify significance/trends based on information provided in figures/charts/graphs/tables. Writing SOP, writing for media.
4. **Vocabulary:** Technical vocabulary from across technical branches (20 words) GRE Vocabulary (20 words) (Antonyms and Synonyms, Word applications) Cloze Encounters.
5. **Grammar:** Quantifying Expressions - Adjectives and Adverbs; Comparing and Contrasting; Use of Antonyms; Direct and Indirect Speech, Reporting Verbs for Academic Purposes. Idiomatic Expressions (25 Idioms)

UNIT V

1. **TEXT: Stay Hungry-Stay foolish** from "**Infotech English**", Maruthi Publications
2. **Reading:** Reading for Comprehension. RAP Strategy Intensive Reading and Extensive Reading Techniques.
3. **Reading for Writing:** Report writing (Significance, Format and Style of Writing Technical Reports)
4. **Vocabulary:** Technical vocabulary from across technical branches (20 words) GRE Vocabulary (20 words) (Antonyms and Synonyms, Word applications) Coherence, Matching Emotions.
5. **Grammar:** Change of Voice; Editing Short Texts – Identifying and Correcting Common Errors in grammar and usage (Articles, Prepositions, Tenses, Subject-Verb Agreement)

Text Book: "Infotech English", Maruthi Publications.

REFERENCE BOOKS:

1. **English Grammar in Use**, Raymond Murphy, Cambridge University Press.
2. **Oxford Practice Grammar**, John Eastwood, Oxford University Press.
3. **The Most Common Mistakes in English Usage** – Thomas Elliott Berry
4. **Essential Communication Skills** – Shalini Agarwal, Ane Books Pvt Ltd.
5. **Dictionary of Synonyms and Antonyms**, Oxford & IBH, III Ed
6. **A Practical English Grammar**, Agnes V. Martinet and Audrey Jean Thomson, Oxford University Press.
7. **English Vocabulary in Use**, Michael McCarthy and Felicity O'Dell, Cambridge University Press

E-RESOURCES

1. <https://www.grammarbank.com/>
2. <http://guidetogrammar.org/grammar/index.htm>
3. <https://writeandimprove.com/>
4. <https://englishforeveryone.org/>
5. <http://www.englishvocabularyexercises.com/>
6. <https://englishplusmagazine.com/>

20A1100201 **ENGINEERING MATHEMATICS-I**
 (Common to CE,EEE,ME,ECE,CSE,IT,AIIML and DS)

Lecture – Tutorial:	3-1	Internal Marks:	30
Credits:	4	External Marks:	70
Prerequisites: Fundamentals of matrices, Fundamentals of Trigonometry and Calculus.			
Course Objectives:			
<ul style="list-style-type: none"> • To instruct the concept of Matrices in solving linear algebraic equations • To elucidate the different numerical methods to solve nonlinear algebraic equations • To disseminate the use of different numerical techniques for carrying out numerical integration. • To equip the students with standard concepts and tools at an intermediate to advanced level mathematics to develop the confidence and ability among the students to handle various real world problems and their applications. 			
Course Outcomes:			
CO1	Student will be able to develop the use of matrix algebra techniques that is needed by engineers for practical applications (L6) solve system of linear algebraic equations using Gauss elimination, Gauss Seidel and write Eigen values and eigenvectors of a matrix (L3)		
CO2	Student will be able to write diagonal form and different factorizations of a matrix (L3), to find inverse of a matrix and integral powers of a matrix by Cayley-Hamilton Theorem identify the nature of a Quadratic form such as positive definite, positive semi definite etc., and use this information to facilitate the calculation of matrix characteristics (L2)		
CO3	Student will be able to evaluate the approximate roots of polynomial and transcendental equations by different algorithms (L5)		
CO4	Student will be able to apply Newton's forward & backward interpolation and Lagrange's formulae for unequal intervals (L3)		
CO5	Student will be able to apply numerical integral techniques to different Engineering problems (L3)		
CO6	Student will be able to apply different algorithms for approximating the solutions of ordinary differential equations with initial conditions to its analytical computations (L3)		

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	3	3	2	2								
CO2	3	3	2	2								
CO3	3	3	2	2								
CO4	3	3	2	2								
CO5	3	3	2	2								
CO6	3	3	2	2								

UNIT – I: Solving systems of linear equations, Eigen values and Eigen vectors: (10hrs)

Rank of a matrix by echelon form and normal form – Solving system of homogeneous and non- homogeneous linear equations – Gauss

Elimination method – Eigen values and Eigen vectors and properties.	
Unit – II: Cayley–Hamilton theorem and Quadratic forms: (10hrs)	Cayley-Hamilton theorem (without proof) – Applications – Finding the inverse and power of a matrix by Cayley-Hamilton theorem – Reduction to Diagonal form – Quadratic forms and nature of the quadratic forms – Reduction of quadratic form to canonical forms by orthogonal transformation.
UNIT – III: Iterative methods: (8 hrs)	Introduction– Bisection method – Method of false position– Iteration method Newton-Raphson method (One variable). Gauss-Jacobi and Gauss-Seidel methods for solving system of equations numerically.
UNIT – IV: Interpolation: (10 hrs)	Introduction– Errors in polynomial interpolation – Finite differences– Forward differences– Backward differences –Central differences – Relations between operators – Newton’s forward and backward formulae for interpolation – Interpolation with unequal intervals – Lagrange’s interpolation formula.
UNIT –V: Numerical integration and Solution of ordinary differential equations with initialconditions (10 hrs)	Trapezoidal rule– Simpson’s 1/3 rd and 3/8 th rule– Solution of initial value problems by Taylor’s series– Picard’s method of successive approximations– Euler’s method –Modified Euler’s method – Runge-Kutta method (second and fourth order).
TEXT BOOKS:	
<ol style="list-style-type: none"> B. S. Grewal, Higher Engineering Mathematics, 44th Edition, Khanna Publishers. B. V. Ramana, Higher Engineering Mathematics, 2007 Edition, Tata Mc. Graw Hill Education. David Poole, Linear Algebra- A modern introduction, 4th Edition, Cengage. 	
REFERENCE BOOKS:	
<ol style="list-style-type: none"> Steven C. Chapra, Applied Numerical Methods with MATLAB for Engineering and Science, Tata Mc. Graw Hill Education. M. K. Jain, S.R.K. Iyengar and R.K. Jain, Numerical Methods for Scientific and Engineering Computation, New Age International Publications. Lawrence Turyn, Advanced Engineering Mathematics, CRC Press. 	
E-RESOURCES: 1. www.nptel.videos.com/mathematics/ (Math Lectures from MIT, Stanford, IIT’S	
2. nptl.ac.in/courses/1221104017	

**20A1100202 : ENGINEERING PHYSICS
(Common to CE and ME)**

Lecture – Tutorial:	3-0	Internal Marks:	30									
Credits:	3	External Marks:	70									
Prerequisites: Knowledge on fundamental concepts of waves, optics, sound and magnetism												
Course Objectives:												
❖ The course aims at making students to understand the basic concepts of Principles of Physics in a broader sense with a view to lay foundation for the various engineering courses.												
❖ To develop analytical capability and solve various engineering problems.												
Course Outcomes:												
CO1	Apply the interaction of light with matter through interference, diffraction, polarization and identify these phenomena in different natural optical processes and optical instruments.											
CO2	Apply the comprehended knowledge about laser and fibre optic communication systems in various engineering applications.											
CO3	Interpret the knowledge of dielectric and magnetic materials with characteristic utility in appliances.											
CO4	Apply the principles of acoustics to explain the nature and characterization of acoustic design and to provide a safe and healthy environment.											
CO5	Apply the knowledge of non-destructive testing using ultrasonics in various engineering applications.											
CO6	Study the Structure-property relationship exhibited by solid crystal materials for their utility.											
Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – High)												
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	3				3					3		
CO2	3	3		2	2					3		
CO3	3	3	3		3							
CO4	3				2							
CO5	3											
CO6	3				2							
Unit-I: Wave Optics (12hrs)												
Interference: Principle of superposition –Interference of light - Interference in thin films (Reflection Geometry) - Colors in thin films- Newton’s Rings- Determination of wavelength and refractive index.												
Diffraction: Introduction - Fresnel and Fraunhofer diffraction - Fraunhofer diffraction due to single slit, double slit - N-slits (Qualitative) – Diffraction Grating - Dispersive power and resolving power of Grating (Qualitative).												
Polarization: Introduction-Types of polarization - Double refraction - Nicol’s Prism -Half wave and Quarter wave plates.												
Unit-II: Lasers and Fiber optics (8hrs)												
Lasers: Introduction – Characteristics of laser – Spontaneous and Stimulated emissions of radiation – Einstein’s coefficients – Population inversion – Lasing action - Pumping Schemes – Ruby laser – He-Ne laser - Applications of lasers.												
Fiber optics: Introduction –Principle of optical fiber- Acceptance Angle - Numerical												

Aperture -

Classification of optical fibers based on refractive index profile and modes –

Propagation of electromagnetic wave through optical fibers - Applications.

Unit-III: Magnetic and Dielectric Materials

(10hrs)

Magnetic Materials: Introduction - Origin of permanent magnetic moment -

Classification of

magnetic materials: Dia, para, Ferro, antiferro & Ferri magnetic materials - Domain concept for Ferromagnetism & Domain walls (Qualitative) - Hysteresis - soft and hard magnetic materials.

Dielectric Materials: Introduction - Dielectric polarization - Dielectric polarizability, Susceptibility and Dielectric constant - Types of polarizations- Electronic (Quantitative), Ionic (Quantitative) and Orientation polarizations (Qualitative) - Lorentz internal field- Clausius- Mossotti equation.

Unit-IV: Acoustics and Ultrasonics

(10hrs)

Acoustics: Introduction – requirements of acoustically good auditorium– Reverberation – Reverberation time– Sabine’s formula - Absorption coefficient and its determination – Factors affecting acoustics of buildings and their remedial measures.

Ultrasonics: Introduction - Properties - Production by magnetostriction and piezoelectric methods – Detection - Non Destructive Testing – pulse echo system through transmission and reflection modes - Applications.

Unit-V: Crystallography and X-ray diffraction

(8hrs)

Crystallography: Space lattice, Basis, Unit Cell and lattice parameters – Bravais Lattice – crystal systems (3D) – coordination number - packing fraction of SC, BCC & FCC - Miller indices – separation between successive (hkl) planes.

X- ray diffraction: Bragg’s law - X-ray Diffractometer – crystal structure determination by Laue’s and powder methods.

TEXT BOOKS:

1. **M. N. Avadhanulu, P.G.Kshirsagar & TVS Arun Murthy**” A Text book of Engineering Physics”- S.Chand Publications, 11th Edition 2019.
2. Engineering Physics by **P.K.Palanisamy** SciTech publications

REFERENCE BOOKS:

1. Engineering Physics by **M.R.Srinivasan**, New Age international publishers (2009).
2. Engineering Physics - **Sanjay D. Jain, D. Sahasrabudhe and Girish**, University Press
3. **B.K. Pandey and S. Chaturvedi**, Engineering Physics, Cengage Learning

E-RESOURCES: www.doitpoms.ac.uk,

<http://www.itp.uni-hannover.de/~zawischa/ITP/diffraction.html>,

<http://www.coherent.com/products/?834/Lasers>,

20A1101401: ENGINEERING DRAWING
(Common to Civil and Mechanical Engineering)

Lecture – Practical:	2 - 2 Hours	Internal Marks:	30
Credits:	3	External Marks:	70

Prerequisites:

1. Knowledge of basic Mathematics
2. Drawing skills

Course Objectives:

1. To introduce the students the usage of drawing instruments and to draw polygons, Engg. Curves and scales.
2. To introduce the students to use orthographic projections, projection of points & simple lines.
3. To make the students draw the projections of the lines inclined to both the planes.
4. To make the students draw the projections of the plane inclined to both the planes.
5. To make the students draw the projections of the various types of solids in different positions inclined to one of the planes.
6. To represent the object in 3D view through isometric views and to convert the isometric view to orthographic view and vice versa.

Course Outcomes:

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

CO1	Understand the simple geometric constructions like polygons, engineering curves and scales.
CO2	Understand the orthographic projections of points and lines
CO3	Understand the orthographic projections of straight lines- inclined to one plane and inclined to both the planes.
CO4	Understand the orthographic projections of planes and Planes inclined to both the planes.
CO5	Understand and draw the projections of the various types of solids in different positions inclined to one of the planes
CO6	Understand the transformation of orthographic views into isometric views and vice versa.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	3	2	-	-	-	-	-	-	-	3	-	1
CO2	3	2	-	-	-	-	-	-	-	3	-	1
CO3	3	2	-	-	-	-	-	-	-	3	-	1
CO4	3	2	-	-	2	-	-	-	-	3	-	1
CO5	3	2	-	-	2	-	-	-	-	3	-	1
CO6	3	2	-	-	2	-	-	-	-	3	-	1

UNIT I

Polygons: Constructing regular polygons by general methods, inscribing and describing polygons on circles.

Curves: Parabola, Ellipse and Hyperbola by general and special methods, cycloids,

involutes, tangents & normals for the curves.

Scales: Plain scales, diagonal scales and vernier scales

UNIT II

Orthographic Projections: Reference plane, importance of reference lines, projections of points in various quadrants, projections of lines, line parallel to both the planes, line parallel to one plane and inclined to other plane.

Projections of straight lines inclined to both the planes, determination of true lengths, angle of inclination.

UNIT III

Projections of planes: regular planes perpendicular/parallel to one reference plane and inclined to the other reference plane; inclined to both the reference planes.

UNIT IV

Projections of Solids – Prisms, Pyramids, Cones and Cylinders with the axis inclined to both the planes.

UNIT V

Conversion of isometric views to orthographic views; Conversion of orthographic views to isometric views.

Computer Aided Design, Drawing practice using Auto CAD, Creating 2D&3D drawings of objects using Auto CAD

Note: In the End Examination there will be no question from CAD.

TEXT BOOKS:

1. Engineering Drawing by N.D. Butt, Chariot Publications
2. Engineering Drawing by Agarwal & Agarwal, Tata McGraw Hill Publishers

REFERENCE BOOKS:

1. Engineering Drawing by K.L.Narayana & P. Kannaiah, Scitech Publishers
2. Engineering Graphics for Degree by K.C. John, PHI Publishers
3. Engineering Graphics by PI Varghese, McGrawHill Publishers
4. Engineering Drawing + AutoCad – K Venugopal, V. Prabhu Raja, New Age

**20A1102301: BASIC ELECTRICAL & ELECTRONICS ENGINEERING
(Civil ENGINEERING)**

Lecture – Tutorial:	4-1 Hours	Internal Marks:	30
Credits:	3	External Marks:	70

Prerequisites: Students are expected to have knowledge on the following topics:
Algebra , simple integral equations & simple differential equations
(Mathematics)

Course Objectives:

6. To learn the basic principles of electrical law's and analysis of networks..
7. To understand the principle of operation and construction details of DC and AC Machines.
8. To understand the principle of operation and construction details of transformer.
9. To study the operation of PN junction diode, half wave, full wave rectifiers and Transistors.

Course Outcomes:

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

CO1	Analyze the various electrical networks.
CO2	Understand the principle of operation of DC machines
CO3	Understand the principle of operation of AC machines
CO4	Understand the principle of operation of Transformers
CO5	Able to analyze the operation of PN junction Diode & OP-AMPS
CO6	Analyze the operation of Transistor configurations

**Contribution of Course Outcomes towards achievement of Program Outcomes
(1 – Low, 2- Medium, 3 – High)**

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	3	3	1									
CO2	3	2										
CO3	2	1										
CO4	3	3										
CO5	3	2										
CO6	3	2	1									

NIT I

Electrical Circuits

Basic definitions – types of network elements – Ohm's Law – Kirchhoff's Laws – inductive networks – capacitive networks – series – parallel circuits – star-delta and delta-star transformations.-Numerical Problems.

UNIT II

DC Machines

Principle of operation of DC generator – EMF equation – types of DC machines – torque equation characteristics of DC motors – applications – three point starter – speed control methods of DC motor – Swinburne's Test-Brake test on DC shunt motor-Numerical problems

UNIT III

AC Machines:

Transformers

Principle of operation and construction of single phase transformers – EMF equation – Losses – OC & SC tests – efficiency and regulation-Numerical Problems.

AC Rotating Machines

Principle of operation and construction of alternators – types of alternators Regulation of alternator by synchronous impedance method – principle of operation of synchronous motor – principle of operation of 3-Phase induction motor – slip-torque characteristics – efficiency – applications- Numerical Problems.

UNIT IV**Rectifiers & Linear ICs**

PN junction diodes – diode applications (half wave and bridge rectifiers). Characteristics of operation amplifiers (OP-AMP) – application of OP-AMPs (inverting, non-inverting, integrator and differentiator)- Numerical Problems

UNIT V**Transistors**

PNP and NPN junction transistor, transistor as an amplifier– frequency response of CE amplifier – Basic concepts of feedback amplifier-Numerical problems.

REFERENCE BOOKS:

- 1.Basic Electrical Engineering by M.S.Naidu and S.Kamakshiah,TMH Publications.
- 2.Fundamentals of Electrical Engineering by Rajendra Prasad, PHI Publications, 2nd edition.
- 3.Basic Electrical Engineering by Nagsarkar, Sukhija, Oxford Publications, 2nd edition.
- 4.Industrial Electronics by G.K. Mittal, PHI

**20A1100291: ENGINEERING PHYSICS LAB
(Common to CE and ME)**

Labs / Instructions Hours/Week	3	Internal Marks:	30
Credits:	2	External Marks:	70

Prerequisites: Knowledge on vernier callipers, Screw guage, common balance

Course Objectives:

- ❖ The Objective of this course is to make the students gain practical knowledge to co-relate with the theoretical studies.
- ❖ To achieve perfectness in experimental skills and the study of practical applications will bring more confidence and ability to develop and fabricate engineering and technical equipments.
- ❖ Training field oriented Engineering graduates to handle instruments and their design methods to improve the accuracy of measurements.

Course Outcomes:

CO1	Understand principle, concept, working of an instrument and can compare results with theoretical calculations.
CO2	Analyze the physical principle involved in the various instruments; also relate the principle to new application.
CO3	Understand design of an instrument with targeted accuracy for physical measurements.
CO4	Develop skills to impart practical knowledge in real time solution.
CO5	The various experiments in the areas of optics, mechanics and thermal physics will nurture the students in all branches of Engineering..
CO6	Think innovatively and also improve the creative skills that are essential for engineering.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	3											
CO2	3	3		3					3			
CO3	3	3	1	3					3			
CO4	3	3		3								
CO5	3											
CO6	3	3	2	3								

List of Experiments

1. Study of variation of magnetic field along the axis of a current carrying circular coil by Stewart & Gee's method.
2. Determination of numerical aperture and acceptance angle of an optical fiber.
3. Determination of thickness of thin object by wedge method.
4. Determination of radius of curvature of given plano convex lens by Newton's rings.
5. Determination of wavelengths of different spectral lines in mercury spectrum using diffraction grating in normal incidence configuration.
6. Determination of dispersive power of the prism.
7. Sonometer: Verification of laws of string.
8. Study of I/V Characteristics of Semiconductor diode.
9. I/V characteristics of Zener diode.
10. Melde's experiment-Longitudinal and Transverse mode.

11. Study the variation of B versus H by magnetizing the magnetic material (B-H curve).
12. Estimation of Planck's constant using photoelectric effect.
13. Determination of Hall voltage and Hall coefficient of a given semiconductor using Hall Effect
14. Determination of wavelength of Laser light using diffraction grating.
15. Rigidity modulus of material of a wire-dynamic method (Torsional pendulum).

Note: Any 8 experiments out of 15 should be done in the laboratory and 2 experiments in virtual lab.

TEXT BOOKS:

S. Balasubramanian, M.N. Srinivasan "A Text book of Practical Physics"- S Chand Publishers, 2017.

REFERENCE BOOKS:

Engineering Physics / Applied Physics Lab Manual – **Spectrum Publications**

E-RESOURCES: www.vlab.co.in

**20A1101391-BASICS OF CIVIL & ELECTRICAL ENGG. WORKSHOP
(Civil Engineering)**

Practical	3 Hours	Internal Marks:	30
Credits:	1.5	External Marks:	70

Prerequisites:**Course Objectives:**

- To outline the process of identification of various building components and their estimation
- To provide knowledge on operation of the various survey instruments used for linear and angular measurements.
- To explain the concept of measurement of discharge and velocity in a pipe and density of water
- To demonstrate automatic weather station.

Course Outcomes:

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

CO1	Identify various components of a building and give lump-sum estimate.
CO2	Determine distances and irregular areas using conventional survey instruments like chain ,tape, cross-staff and compass
CO3	Identify different soils & Know various traffic signs & signals
CO4	Determine centre of gravity and moment of inertia of channel and I-sections.
CO5	Set out a signal room building as per given plan & Install simple sanitary filling and find discharge/velocity in a water pipe line as density of water
CO6	Know to the process of making cement mortar / concrete for nominal mix

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	2	1	-	-	-	-	-	1	-	-	-	-
CO2	2	2	-	-	-	-	-	2	-	-	-	-
CO3	2	1	-	-	-	-	-	1	-	-	-	-
CO4	2	2	-	-	-	-	-	2	-	-	-	-
CO5	2	2	-	-	-	-	-	2	-	-	-	-
CO6	2	1	-	-	-	-	-	1	-	-	-	-

List of Experiments**PART-A (CIVIL)**

1. Demonstration on usage of chain
2. Ranging – offsets – chain-age
3. To find the area of an irregular polygon using chain by using horizontal measurements
4. Determination of bearings and included angles with prismatic compass.
5. Demonstration on various Building materials used in construction
6. Estimation of quantity of bricks, concrete, wood, paint for the given single room building
7. Masonry work hands – on practice work deferent types of bonds in brick masonry
8. Identification of quality of brick through physical tests
9. Identification of soil based on their physical properties
10. Setting out of building: The student is required to set out a building

(Single room only) as per the given building plan using tape and cross staff.

11. Demonstration on Installation of simple sanitary fittings and fixtures like Tap, T-joint, Elbow, bend, threading etc.
12. Finding the discharge velocity in a water pipe line also find density of water
13. Computation of Centre of gravity and moment of inertial of (i) I-section and (ii) Channel section.
14. Welding (arc welding and gas welding)
15. Carpentry (Demonstration)
16. Identify deferent types of roads in the campus and write the physical characteristics of layers
17. Demonstration on making of cement mortar/concrete for the given nominal mix
18. Study of given Topo-sheet

PART-B (ELECTRICAL)

1. Introduction
2. Three lamps control by a single switch in series connection
3. Three lamps control by a single switch in parallel connection
4. Staircase Wiring
5. Fluorescent lamp fitting

TEXT BOOKS:

REFERENCE BOOKS:

Laboratory Manual for Basic Civil Engineering workshops

E-RESOURCES:

20A120001: ENGINEERING MATHEMATICS-II
(Common to All Branches)

Lecture – Tutorial:	3-1	Internal Marks:	30
Credits:	4	External Marks:	70

Prerequisites: Fundamentals of matrices, Fundamentals of Trigonometry and Calculus.

Course Objectives:

- To familiarize a variety of well-known sequences and series, with a developing intuition about the behaviour of new ones.
- To enlighten the learners in the concept of differential equations and multivariable calculus.
- To equip the students with standard concepts and tools at an intermediate to advanced level mathematics to develop the confidence and ability among the students to handle various real world problems and their applications.

Course Outcomes:

CO1	Student will be able to find the General/Particular solutions of first order and first degree ordinary differential equations by apply different methods (L3) , know the applications of Newton’s law of cooling, natural growth and decay problems and find orthogonal trajectories of the given family of curves. (L3)
CO2	Student will be able to identify the essential characteristics of linear differential equations with constant coefficients. (L2) solve the linear differential equations with constant coefficients by appropriate method (L3)
CO3	Student will be able to find convergence (or) divergence of a series (L3)
CO4	Student will be able to utilize mean value theorems to real life problems (L3)
CO5	Student will be able to find partial derivatives numerically and symbolically and use them to analyze and interpret the way a function varies. (L4) acquire the Knowledge maxima and minima of functions of several variable (L1) Utilize Jacobian of a coordinate transformation to deal with the problems in change of variables (L3)
CO6	Student will be able to find length of the arc, volume of solid of revolution and surface area of solid of revolution (L3)

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	3	3	2	2								
CO2	3	3	2	2								
CO3	3	3	2	2								
CO4	3	3	2	2								
CO5	3	3	2	2								
CO6	3	3	2	2								

UNIT – I: Differential equations of first order and first degree: (10hrs)

Linear differential equations– Bernoulli’s equations –Exact equations and equations reducible to exact form. Applications: Newton’s Law of cooling– Law of natural growth and decay– Orthogonal trajectories.

UNIT-II: Linear Differential equations of higher order: (10hrs)

Homogeneous and Non-homogeneous differential equations of higher order with constant coefficients – with non-homogeneous term of the type e^{ax} , $\sin ax$, $\cos ax$, polynomials in x^n , $e^{ax}V(x)$ and $x^nV(x)$ – Method of Variation of

parameters, Cauchy and Legendre's linear equations.

UNIT – III: Sequences, Series and Mean value theorems: (10hrs)

Sequences and Series: Convergences and divergence – Ratio test – Comparison tests – Integral test – Cauchy's root test – Alternate series– Leibnitz's rule. Mean Value Theorems (without proofs): Rolle's Theorem – Lagrange's mean value theorem – Cauchy's mean value theorem – Taylor's and Maclaurin's theorems with remainders, Problems and applications on the above theorem.

UNIT – IV: Partial differentiation: (10hrs)

Introduction – Homogeneous function – Euler's theorem– Total derivative– Chain rule– Jacobian – Functional dependence –Taylor's and MacLaurin's series expansion of functions of two variables.Applications: Maxima and Minima of functions of two variables without constraints and Lagrange's multiplied method.

UNIT – V: Multiple integrals: (8hrs)

(8

Double and Triple integrals – Change of order of integration in double integrals – Change of variables to polar, cylindrical and spherical coordinates. Applications: Finding Areas and Volumes

TEXT BOOKS:

1. **B. S. Grewal**, Higher Engineering Mathematics, 44th Edition, Khanna Publishers.
2. **B. V. Ramana**, Higher Engineering Mathematics, 2007 Edition, Tata Mc. Graw Hill Education.

REFERENCE BOOKS:

1. **Erwin Kreyszig**, Advanced Engineering Mathematics, 10th Edition, Wiley-India.
2. **Joel Hass, Christopher Heil and Maurice D. Weir**, Thomas calculus, 14th Edition, Pearson.
3. **Lawrence Turyn**, Advanced Engineering Mathematics, CRC Press, 2013.
4. **Srimantha Pal, S C Bhunia**, Engineering Mathematics, Oxford University Press.

E-RESOURCES:

1. www.nptel.videos.com/mathematics/ (Math Lectures from MIT, Stanford, IIT'S)
2. nptl.ac.in/courses/1221104017

20A1200204 Engineering Chemistry)
(Common to CE and ME)

Lecture – Tutorial:	3-0	Internal Marks:	30
Credits:	3	External Marks:	70

Prerequisites: Fundamentals of Polymers and Electro Chemical cells.

Course Objectives:

Engineering Chemistry is an applied manifestation of Chemistry and its thorough knowledge in fundamental aspects, essential for Civil and Mechanical to understand chemical structure and other aspects of materials. The study of applied concepts of Chemistry endeavoured in this course namely; Polymer technology, electrochemistry, corrosion, Chemistry of materials, fuels and water treatment helps the student in comprehending their engineering applications with right aptitude and ability in predicting the results under given conditions.

Course Outcomes:

CO1	Analyze the different types of composite plastic materials and interpret the mechanism of conduction in conducting polymers.
CO2	Predict potential complications from combining various chemicals and metals in engineering setting
CO3	Discuss fundamental aspects of electrochemistry and materials science relevant to corrosion phenomena
CO4	Apply Nano chemistry, Refractories, Lubricants, cement in engineering processes
CO5	Discuss the various petroleum products and alternate fuels
CO6	Examine the water quality and select appropriate purification technique for intended problem

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	3	3	3	1								
CO2	3	3	2	1								
CO3	3	2	2	1								
CO4	3	3	2	2								
CO5	3	2	2	1								
CO6	3	3	2	1								

UNIT I

POLYMER TECHNOLOGY

Polymerisation:- Introduction, methods of polymerization (emulsion and suspension), mechanical properties.

Plastics: Thermoplastic-thermosetting Compounding, fabrication (compression, injection, transfer and extrusion), preparation, properties and applications (PVC, polycarbonates and Bakelite), mention some examples of plastic materials used in electronic gadgets.

Elastomers:- Introduction, preparation, properties and applications (Buna S, thiokol and polyurethanes). **Composite materials:** Fiber reinforced plastics, conducting polymers, biodegradable polymers,

UNIT II

ELECTROCHEMICAL CELLS AND CORROSION: Single electrode potential, electrochemical series and uses of series, standard hydrogen electrode, calomel electrode, batteries (Dry cell, liquid Li ion battery), fuel cells (H₂-O₂).

Corrosion:- Definition, theories of corrosion (chemical and electrochemical), galvanic corrosion, differential aeration corrosion, galvanic series, factors influencing rate of corrosion, corrosion control methods-Protective coatings (Galvanizing, tinning electroplating and electroless plating [nickel]),

<p>UNIT III CHEMISTRY OF MATERIALS</p> <p>Nano materials:- Introduction, sol-gel method, characterization by transmission electron microscopy [TEM] , carbon nanotubes (types, preparation and applications) Refractories: - Definition, classification, properties (refractoriness, refractoriness under load, porosity and thermal spalling), failure of refractories. Lubricants: - Definition, mechanism of lubricants, properties (definition and importance). Cement: - Constituents, manufacturing, parameters to characterize the clinker formation: lime saturation factor (LSF), silica ratio (SR) and alumina ratio (AR), chemistry of setting and hardening, deterioration of cement.</p>
<p>UNIT IV FUELS 10 hrs</p> <p>Introduction, calorific value, higher calorific value, lower calorific values, problems using Dulong's formula, proximate and ultimate analysis of coal sample and their significance, petroleum (refining-cracking), synthetic petrol (Fischer Tropsch), petrol knocking, diesel knocking, octane and cetane ratings, anti-knocking agents, Introduction to alternative fuels (Bio-diesel, natural gas, liquefied petroleum gas, compressed natural gas), Flue gas analysis by Orsat apparatus.</p>
<p>UNIT V WATER TECHNOLOGY 8 hrs</p> <p>Hardness of water, determination of hardness by complexometric method, boiler troubles (priming and foaming, scale formation, boiler corrosion, caustic embrittlement), internal treatments, softening of hard water (zeolite process and ion exchange process), potable water and its specifications, steps involved in purification of water, chlorination, break point chlorination-desalination (reverse osmosis and electro dialysis).</p>
<p>TEXT BOOKS:</p>
<ol style="list-style-type: none"> 1. P.C. Jain and M. Jain "Engineering Chemistry", 15/e, Dhanpat Rai & Sons, Delhi, (Latest edition). 2. Shikha Agarwal, "Engineering Chemistry", Cambridge University Press, New Delhi, (2019). 3. S.S. Dara, "A Textbook of Engineering Chemistry", S.Chand & Co, (2010). 4. Shashi Chawla, "Engineering Chemistry", Dhanpat Rai Publishing Co. (Latest edition).
<p>REFERENCE BOOKS:</p>
<ol style="list-style-type: none"> 1. K. Sessa Maheshwaramma and Mridula Chugh, "Engineering Chemistry", Pearson India Edn. 2. (a) O.G. Palana, "Engineering Chemistry", Tata McGraw Hill Education Private Limited, (2009). (b) CNR Rao and JM Honig (Eds) "Preparation and characterization of materials" Academic press, New York (latest edition) 3. B. S. Murthy, P. Shankar and others, "Textbook of Nanoscience and Nanotechnology", University press (latest edition)
<p>E-RESOURCES:</p>
<ol style="list-style-type: none"> 1. https://en.wikipedia.org/wiki/Water_treatment 2. https://en.wikipedia.org/wiki/Conductive_polymers 3. www.sae.org/fuel_cells/fuelcells-types.htm 4. https://en.wikipedia.org/wiki/Nanomaterials 5. https://en.wikipedia.org/wiki/Electrochemical_cell 6. https:// www.britancia.com/technology/cement-building-material

20A1201401: THEORY OF MECHANICS
(Civil Engineering)

Lecture – Practical:	3 - Hours	Internal Marks:	30
Credits:	3	External Marks:	70

Prerequisites:

1. Engineering Physics
2. Engineering Mathematics

Course Objectives:

1. To introduce the concepts of force and friction, direction and its application to the students.
2. To make the students expose to the application of free body diagrams. Solution to problems using graphical methods and law of triangle of forces.
3. To introduce the concepts of centre of gravity, concepts of moment of inertia and polar moment of inertia including transfer methods and their applications to the students.
4. The students are to be exposed to motion in straight line and in curvilinear paths, its velocity and acceleration computation and methods of representing plane motion.
5. The students are to be exposed to rigid body motion kinematics and kinetics

Course Outcomes:

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

CO1	Compute the resultant of forces and moments using free body diagrams.
CO2	Analyze free body diagrams & can solve problems using graphical methods and law of triangle of forces.
CO3	Identify the Centroid and Centre of Gravity of the simple, composite figures and able to apply the concepts of friction.
CO4	Determine the area and mass moment of inertia of the composite figures and bodies.
CO5	Understand the fundamental concepts of kinematics and kinetics of rigid body.
CO6	Able to apply the work energy and Impulse momentum principle to analyze the simple, practical problems.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – High)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	-	-	-	-	-	-	-	-	-	-
CO2	3	2	-	-	-	-	-	-	-	-	-	-
CO3	3	2	-	-	-	-	-	-	-	-	-	-
CO4	3	2	-	-	-	-	-	-	-	-	-	-
CO5	3	2	-	-	-	-	-	-	-	-	-	-
CO6	3	2	-	-	-	-	-	-	-	-	-	-

UNIT I

Introduction to Engg. Mechanics – Basic Concepts. Systems of Forces: Coplanar Concurrent Forces – Components in Space – Resultant – Moment of Force and its Application – Couples and Resultant of Force Systems. Introduction, limiting friction and impending motion, coulomb's laws of dry friction, coefficient of friction, cone of friction

UNIT II

Equilibrium of Systems of Forces : Free Body Diagrams, Equations of Equilibrium of Coplanar Systems, Spatial Systems for concurrent forces. LamisTheorm, Graphical method for the equilibrium of coplanar forces, Converse of the law of Triangle of forces, converse of the law of polygon of forces condition of equilibrium.

UNIT III

Centroid :Centroids of simple figures (from basic principles) – Centroids of Composite Figures Centre of Gravity :Centre of gravity of simple body (from basis principles), centre of gravity of composite bodies, pappus theorem.

FRICTION Types of friction – Limiting friction – Laws of Friction – static and Dynamic Frictions – Angle of Friction –Cone of limiting friction– Friction of wedge, block and Ladder.

UNIT IV

Area moments of Inertia :Definition – Polar Moment of Inertia, Transfer Theorem, Moments of Inertia of Composite Figures, Products of Inertia, Transfer Formula for Product of Inertia.

Mass Moment of Inertia :Moment of Inertia of Masses, Transfer Formula for Mass Moments of Inertia, mass moment of inertia of composite bodies.

UNIT V

Kinematics: Rectilinear and Curvelinear motions – Velocity and Acceleration – Motion of Rigid Body – Types and their Analysis in Planar Motion. Introduction – Rectilinear motion – Motion with uniform and variable acceleration–Curvilinear motion–Components of motion– Circular motion – Projectiles- Instantaneous centre

Kinetics: Kinetics of a particle – D'Alembert's principle – Motion in a curved path – work, energy and power. Principle of conservation of energy – Kinetics of a rigid body in translation, rotation – work done – Principle of work-energy – Impulse-momentum.

TEXT BOOKS:

1. Engineering Mechanics - S.Timoshenko & D.H.Young., 4th Edition - , Mc Graw Hill publications.

REFERENCE BOOKS:

1. Engineering Mechanics by S S Bhavikatti, New age International
2. Engineering Mechanics by R K Bansal, Laxmi Publications

**20A1205301: Programming and Problem Solving with C
(Civil Engineering)**

Lecture – Tutorial-Practical::	3-0-0	Internal Marks:	30
Credits:	3	External Marks:	70

Prerequisites: Basic knowledge on computers, Mathematics

Course Objectives: The objectives of Programming for Problem Solving Using C are

- To learn about the computer systems, computing environments, developing of a computer program and Structure of a C Program
- To gain knowledge of the operators, selection, control statements and repetition in C
- To learn about the design concepts of arrays, strings, enumerated structure and union types and their usage.
- To assimilate about pointers, dynamic memory allocation and know the significance of Preprocessor.
- To assimilate about File I/O and significance of functions

Course Outcomes:

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

CO1	Understand the programming terminology and implement various c-tokens & input-output statements to solve simple problems
CO2	Able to compare and differentiate various looping & branching constructs and apply the best looping structure for a given problem
CO3	Identify the necessity of modularity in programming and design various function types
CO4	Understand pointers and implement the programs to directly access memory locations
CO5	Interpret and implement the need of arrays and structure/union to store homogeneous and heterogeneous groups of data
CO6	Contrast the need of using files in programming and implement file operations

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	3	--	2	--	3	--	--	--	--	--	--	2
CO2	--	2	3	--	2	--	--	--	--	--	--	--
CO3	--	2	3	--	--	--	--	--	--	--	--	2
CO4	3	--	2	2	2	--	--	--	--	--	--	--
CO5	--	--	3	--	--	--	--	--	--	--	--	3
CO6	--	--	3	--	--	--	--	--	--	--	--	--

UNIT I : Objective: Notion of Computer Languages, algorithm, computational procedure, editing and executing programs and C Declarations

BASICS AND INTRODUCTION TO C: Basics of Computer, Introduction to C, Machine, Assembly and High level Language, Assembler, Compiler and Interpreter, Structure of a C program, Programming Rules, Executing the C Program, Advantages of C, Header Files, Flow Chart, Algorithm.

THE C DECLARATIONS: The C-Character set, Delimiters, Types of Tokens, The C keywords, Identifiers, Constants, Variables, C Data types, initialization, type modifiers, type conversions, constant and volatile variables. Properties of Operators, Operator Priority ,comma and conditional operators, arithmetic, relational, assignment operators and expressions, logical , bitwise operators. Input and output in c: Formatted and Unformatted functions

UNIT II: Objective: Understanding branching, iteration, data representation using arrays and strings

DECISION STATEMENTS: The if statement, if-else, nested if else, if-else-if ladder, break, continue, goto, Switch statement, nested switch case, Switch case and nested ifs.

LOOP CONTROL: for loop, nested for loop, while, do-while, do-while statement with while loop.

ARRAYS: Array initialization, array terminology, characteristics of an array, 1-D array and its operations, 2-D arrays and operations, Multi -dimensional arrays.

STRINGS: Declaration and initialization of string, string standard functions, string conversion functions, memory functions, application of strings.

UNIT III: Objective: Modular programming and recursive solution formulation and storage classes

FUNCTIONS: Basics, function definition, return statement, types of functions, call by value ,call by reference, function as an argument, Functions with operators, Function and Decision Statements, Functions and loop Statements, Functions with arrays and Pointers, Recursion-Types of Recursion, Rules for Recursive Function, Recursion versus Iterations, Advantages and Disadvantages of Recursion, Efficiency of Recursion, Library Functions.

STORAGE CLASS: Variable Lifetime, Automatic Variables, External Variables, Static Variables, Register Variables.

UNIT IV: Objective: Understanding pointers, dynamic memory allocation and Preprocessor Directives.

POINTERS: Features of pointers, pointers and address, pointer declaration, void pointers, arithmetic operations with pointers, pointers and arrays, array of pointers, pointers to pointers, pointers and strings. Dynamic memory allocation

PREPROCESSOR DIRECTIVES: The #define Directive, Defining and Undefining a Macros, The #include Directive

UNIT V: Objective: Understanding derived data types of C and basic of file operations.

STRUCTURE AND UNION: Features of Structures, Declaration and initialization of Structures, Structure within Structure, Arrays of Structure, Pointer to Structure, Structure and functions, typedef, Bit fields, Enumerated Data Type, Unions and Unions Vs Structures.

FILES: Streams and File Types, Steps for File Operations, FILE I/O, Structures Read and Write, Other file function, Command line Arguments.

TEXT BOOKS:

[1] Behrouz A. Forouzan & Richard F. Gilberg , –"Computer Science A Structured Programming Approach using C" , CENGAGE Learning, Third Edition.

REFERENCE BOOKS:

[1]Kernighan and Ritchie , –"The C programming language" , The (Ansi C Version), PHI, second edition.

[2]Yashwant Kanetkar , –"Let us C" , BPB Publications, 2nd Edition 2001.

[3]Paul J. Dietel and Dr. Harvey M. Deitel, –"C: How to Program", Prentice Hall, 7 th edition (March 4,2012).

[4]Herbert Schildt, –"C:The Complete reference", McGraw Hill, 4th Edition, 2002.

[5]K.R.Venugopal, Sundeep R Prasad, –"Mastering C", McGraw Hill, 2nd Edition, 2015

E-RESOURCES:

1.<http://cslibrary.stanford.edu/101/EssentialC.pdf>

2. <http://nptel.ac.in/courses/106104128/>

3.http://www.vssut.ac.in/lecture_notes

20A1201402: Building materials & concrete technology
(Civil Engineering)

Lecture – Practical:	3 - 1 Hours	Internal Marks:	30
Credits:	3	External Marks:	70

Prerequisites:**Course Objectives:**

1. To introduce various building construction materials
2. To describe various properties of ingredients of concrete
3. To explain various properties and tests of fresh Concrete
4. To explain various properties and tests of fresh and Hardened Concrete

Course Outcomes:**Upon successful completion of the course, the student will be able to:**

CO1	Know various engineering properties of building construction materials and suggest their suitability
CO2	Identify the functional role of Aggregates and apply this knowledge to concrete mix design
CO3	Identify the functional role of cement and apply this knowledge to concrete mix design
CO4	Acquire and apply fundamental knowledge in the fresh properties of
CO5	Acquire and apply fundamental knowledge in the hardened properties of concrete
CO6	Acquire the fundamental knowledge in testing of hardened concrete

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – High)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	1	-	-	-	-	-	1	-	-	-	-
CO2	2	2	-	-	-	-	-	1	-	-	-	-
CO3	2	1	-	-	-	-	-	1	-	-	-	-
CO4	2	2	-	-	-	-	-	1	-	-	-	-
CO5	2	2	-	-	-	-	-	2	-	-	-	-
CO6	2	2	-	-	-	-	-	2	-	-	-	-

UNIT I

Stones: Classification of Stones – Properties of stones in structural requirements

Bricks: Composition of good brick earth, various methods of manufacturing of bricks

Tiles: Characteristics of good tile – Manufacturing methods, Types of tiles

Wood: Structure – Properties – Seasoning of timber – Classification of various types of woods used in buildings – Defects in timber

Paints: White washing and distemping, Constituents of paint – Types of paints – Painting of new and old wood – Varnish

UNIT II

Aggregates: Classification of aggregate, Bond, Strength and other mechanical properties of aggregate, Physical properties of aggregate, bulking of sand, Deleterious substance in aggregate, Soundness of aggregate, Alkali-Aggregate reaction – Thermal properties, Sieve analysis – Fineness modulus – Grading curves – Grading of fine and coarse aggregates as per relevant IS code, Maximum aggregate size

Portland Cement: Chemical composition, Hydration, Structure of hydrated cement – Setting of cement, Fineness of cement, Tests for physical properties – Different grades of cements-Supplementary cementitious materials: Fly ash, GGBS, Silica fume, Rice husk ash, Calcinated ash (Basic properties and their

contribution to concrete strength). Admixtures: Mineral and Chemical admixtures

UNIT III

Fresh Concrete-Manufacture of concrete – Mixing and vibration of concrete, Workability – Segregation and bleeding – Factors affecting workability, Measurement of workability by different tests, Effect of time and temperature on workability – Quality of mixing water, Ready mix concrete, Shotcrete

UNIT IV

Hardened Concrete-Water / Cement ratio – Abram's law, Gel space ratio, Nature of strength of concrete – Maturity concept, Strength in tension and compression – Properties of Hardened Concrete (Elasticity, Creep, Shrinkage, Poisson's ratio, Water absorption, Permeability, etc.), Relating between compression and tensile strength, Curing

UNIT V

Testing of Hardened Concrete-Factors affecting properties of Hardened concrete, Compression tests, Tension tests, Flexure tests, Non-destructive testing methods – Codal provisions for NDT – Rebound hammer and UPV method

TEXT BOOKS:

1. "Concrete Technology" by M. S. Shetty - S. Chand & Co., 2004
2. "Engineering Materials" by Rangwala S C, (36th edition), Anand Charotar Publishing House
"Concrete Technology" by Shantha Kumar – Oxford Publications

REFERENCE BOOKS:

1. "Building Materials" by S. K. Duggal, New Age International Publications
2. "Building Materials" by P. C. Verghese, PHI learning (P) Ltd., 2009
3. "Properties of Concrete" by A. M. Neville – Pearson – 4th edition

E-RESOURCES:

- <http://nptel.ac.in/courses/105102012/>
- https://onlinecourses.nptel.ac.in/noc16_ce10/preview
- <http://nptel.ac.in/courses/105104030/http://freevideolectures.com/Course/3357/Concrete-Technology>
- <http://textofvideo.nptel.iitm.ac.in/105102012/lec1.pdf>

20A1200801: ENVIRONMENTAL Sciences
(Common to CE,EEE,ME and ECE)

Lecture – Tutorial:	2-0	Internal Marks:	30+70
Credits:	--	External Marks:	

Prerequisites:

Course Objectives:

The objectives of the course are to impart:

- ❖ Overall understanding of the natural resources.
- ❖ Basic understanding of the ecosystem and its diversity.
- ❖ Acquaintance on various environmental challenges induced due to unplanned anthropogenic activities.
- ❖ An understanding of the environmental impact of developmental activities.
- ❖ Awareness on the social issues, environmental legislation and global treaties.

Course Outcomes:

CO1	➤ Illustrate the importance of sustainability in the progress of a nation. (L2)
CO2	➤ Infer the existence of ecosystems in maintaining ecological balance. (L2)
CO3	➤ Recall the importance of biodiversity and its conservation. (L1)
CO4	➤ Summarize the role of natural resources for the sustenance of life on earth and recognize the need to conserve them. (L2)
CO5	➤ Identify the environmental pollutants and the abatement devices to be used. (L3)
CO6	➤ Interpret environmental related acts and social issues. (L2)

Contribution of Course Outcomes towards achievement of Program Outcomes
(1 – Low, 2- Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	3	2	2	-	-	2	3	2	-	-	2	2
CO2	3	2	2	-	-	2	3	2	-	-	2	2
CO3	3	2	2	-	-	2	3	2	-	-	2	2
CO4	3	2	2	-	-	2	3	2	-	-	2	2
CO5	3	2	2	-	-	2	3	2	-	-	2	2
CO6	3	2	2	-	-	2	3	2	-	-	2	2

UNIT I

(6hrs)

Sustainability: Stockholm and Rio Summit–Global Environmental Challenges: Global warming and climate change, acid rains, ozone layer depletion, population growth and explosion, effects. Role of information technology in environment and human health.

Ecosystems: Concept of an ecosystem. - Structure and function of an ecosystem; Producers, consumers and decomposers. - Energy flow in the ecosystem - Food chains, food webs and ecological pyramids- Ecological succession.

UNIT II

(4hrs)

Biodiversity and its conservation: Definition: genetic, species and ecosystem diversity- classification - Value of biodiversity: consumptive use, productive use, social value. India as a mega diversity nation - Hot-spots of biodiversity - Threats to biodiversity: habitat loss, man-wildlife conflicts. Endangered and endemic species of India – Conservation of biodiversity.

UNIT III**(7hrs)****Natural Resources:** Natural resources and associated problems.

Forest resources: Use and over – exploitation, deforestation – Timber extraction – Mining, dams and other effects on forest and tribal people.

Water resources: Use and over utilization of surface and ground water – Floods, drought, conflicts over water, dams – benefits and problems.

Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources.

Energy resources: Growing energy needs, renewable and non-renewable energy sources use of alternate energy sources.

Role of an individual in conservation of natural resources; Equitable use of resources for sustainable lifestyles.

UNIT IV**(5hrs)****Environmental Pollution:** Definition, Cause, effects and control measures of Air pollution, Water pollution, Soil pollution, Noise pollution, Nuclear hazards. Role of an individual in prevention of pollution. - Pollution case studies, Sustainable Life Studies. Impact of Fire Crackers on Men and his well being.**Solid Waste Management:** Sources, Classification, effects and control measures of urban and industrial solid wastes. Consumerism and waste products, Biomedical, Hazardous and e – waste management.**UNIT V****(6hrs)****Social Issues and the Environment:** Urban problems related to energy, rain water harvesting. Environmental ethics: Issues and possible solutions. Environmental Protection Act -Air (Prevention and Control of Pollution) Act. –Water (Prevention and control of Pollution) Act - Wildlife Protection Act -Forest Conservation Act. Environmental Management: Impact Assessment and its significance various stages of EIA, preparation of EMP and EIS. Ecotourism, Green Campus – Green business and Green politics.**TEXT BOOKS:**

- 1) Perspectives in Environment Studies, Anubha Kaushik, C P Kaushik, New Age International Publishers, 2014
- 2) Environmental Studies, K. V. S. G. Murali Krishna, VGS Publishers, Vijayawada
- 3) Environmental Studies, R. Rajagopalan, 2nd Edition, 2011, Oxford University Press.
- 4) Environmental Studies, P. N. Palanisamy, P. Manikandan, A. Geetha, and K. Manjula Rani; Pearson Education, Chennai

REFERENCE BOOKS:

- 1) Text Book of Environmental Studies, Deeshita Dave & P. Udaya Bhaskar, Cengage Learning.
- 2) A Textbook of Environmental Studies, Shaashi Chawla, TMH, New Delhi
- 3) Environmental Studies, Benny Joseph, Tata McGraw Hill Co, New Delhi

E-RESOURCES: 1. <http://nptel.ac.in/courses.php>.2. <http://jntuk-coeerd.in/>

20A1200191: Communicative English LAB
(Common to All Branches (CE, EEE, MECH, ECE, CSE, IT, AIML, DS))

Labs / Instructions Hours/Week	3 Hours	Internal Marks:	30
Credits	1.5	External Marks:	70

PREREQUISITES: None

COURSE OBJECTIVES

1. To learn the sound systems of English and understand word stress of English.
2. To train the students in the art of conversation and discussion
3. To equip the students with good communication skills.
4. To emphasize the need of English in the technical world.
5. To improve their presentation and participation skills
6. To prepare them for interviews and future job environments.

COURSE OUTCOMES

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

CO 1	Demonstrate better understanding of the nuances of spoken English to put into use in various situation and events.
CO 2	Apply the rules of phonetics–pronunciation, accent and intonation– in their everyday communication
CO 3	Relate their understanding of the importance of spoken skills and the need for life-long learning in day-to-day communication.
CO 4	Construct strategies like critical and analytical skills to participate effectively in group discussions and debates.
CO 5	Demonstrate their ideas accurately and effectively in presentations.
CO 6	Build responses to the questions by listening to short audio texts and identify the context and specific pieces of information.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – High)

	P O 1	P O 2	P O 3	PO 4	PO 5	PO 6	P O 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1										1		2
CO 2										1		2
CO 3												2
CO 4									1	1		2
CO 5										2		2
CO 6										1		2

UNIT I

- Making Inquiries on the phone, Thanking and Responding to Thanks, Responding to Requests and Asking for Directions
- Vowels, Consonants, Pronunciation, Phonetic Transcription, Common Errors in Pronunciation

UNIT II

- Asking for Clarifications, Inviting, Expressing Sympathy, Congratulating, Apologising, Advising, Suggesting, Agreeing and Disagreeing
- Word stress – Di-Syllabic Words, Poly-Syllabic Words, Weak and Strong Forms, Contrastive Stress (Homographs)

UNIT III

- Debating
- Stress in Compound Words, Rhythm, Intonation, Accent Neutralization.

UNIT IV

- Group Discussions
- Listening to Short Audio Texts, and Identifying the context and specific pieces of information to answer a series of questions in speaking.

UNIT V

- Presentation Skills and Interview Skills
- Newspapers reading; Understanding and identifying key terms and structures useful for writing reports.

Lab Manual: “Infotech English”, Maruthi Publications.

Software: k-van solutions Multimedia language lab

REFERENCE BOOKS:

1. **Exercises in Spoken English Part 1,2,3,4**, OUP and CIEFL.
2. **English Pronunciation in use** - Mark Hancock, Cambridge University Press.
3. **English Phonetics and Phonology**-Peter Roach, Cambridge University Press.
4. **English Pronunciation in use**- Mark Hewings, Cambridge University Press.
5. **English Pronunciation Dictionary**- Daniel Jones, Cambridge University Press.
6. **English Phonetics for Indian Students**- P. Bala Subramanian, Mac Millan Publications

E-RESOURCES

1. <https://learnenglish.britishcouncil.org/>
2. <https://rachelsenglish.com/>
3. <https://www.bbc.co.uk/learningenglish/>
4. <https://www.engvid.com/>
5. <https://bbclearningenglish.com>

**20A1200203 : Engineering Chemistry Lab
(Common to CE and ME)**

Labs / Instructions Hours/Week	3	Internal Marks:	30
Credits:	1.5	External Marks:	70

Prerequisites: Knowledge on Volumetric analysis.

Course Objectives:

- ❖ To provide knowledge of chemistry practical's.
- ❖ It enables the students to analyze the different parameters of water sample like hardness and alkalinity and different volumetric titrations.
- ❖ It makes the students to obtain basic knowledge of instrumentation based on different Engineering applications.

Course Outcomes:

CO1	❖ Students of Engineering should understand and apply polymers and plastic technologies along with their utilization to solve the problems of the society.
CO2	❖ Knowledge of cells and sensors utilized in many instruments is necessary to engineering students in solving and applying to batteries and fuel cells.
CO3	❖ Knowledge of electrochemical cells is essential in understanding corrosion along with the methods of controlling to budding engineers.
CO4	❖ Students should have the knowledge of water and its hardness, boiler troubles and problems associated with the environment and its sustainability.
CO5	❖ Knowledge of fuels and energy, their advantages & disadvantages should be known by the students to solve and understand engineering problems.
CO6	❖ Knowledge, design and analysis of materials should be understood by the Engineering students in solving the complex problems of the society.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 - Low, 2- Medium, 3 - High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	3	1	1	1								
CO2	3	3	1	-								
CO3	3	2	2	-								
CO4	3	1	-	1								
CO5	3	2	2	1								
CO6	3	1	1	1								

List of Experiments

1. Introduction to Chemistry laboratory – Molarity, Normality, Primary, secondary standard solutions, Volumetric titrations, Quantitative analysis, Qualitative analysis, etc.
2. Determination of HCl using standard Na₂CO₃ solution.
3. Determination of alkalinity of a sample containing Na₂CO₃ and NaOH.
4. Determination of KMnO₄ using standard Oxalic acid solution.
5. Determination of total hardness of water using standard EDTA solution.
6. Determination of Iron using standard K₂Cr₂O₇ solution
7. Estimation of vitamin C
8. Determination of Iron by a Colorimetric method using thiocyanates as reagent.
9. Conductometric titration between strong acid and strong base.
10. Potentiometric titration between strong acid and strong base.

11. Preparation of Bakelite.
12. Determination of pH of water sample

EQUIPMENT REQUIRED:

PH meters, Potentiometers, Conductometers, colorimeters.

APPARATUS

Burettes, Pipettes, Conical flask, Beakers, Volumetric flask.

REFERENCE BOOKS:

- 1 . A Textbook of Quantitative Analysis, Arthur J. Vogel.
2. Dr.JyotsnaCherukuri (2012) *Laboratory Manual of engineering chemistry-II*, VGSTechno Series
3. Chemistry Practical Manual, Lorven Publications
4. K. Mukkanti (2009) *Practical Engineering Chemistry*, B.S. Publication

Exercise 1:

1. Write a C program to print a block F using hash (#), where the F has a height of six characters and width of five and four characters.
2. Write a C program to compute the perimeter and area of a rectangle with a height of 7 inches and width of 5 inches.
3. Write a C program to display multiple variables.

Exercise 2:

1. Write a C program to calculate the distance between the two points.
2. Write a C program that accepts 4 integers p, q, r, s from the user where r and s are positive and p is even. If q is greater than r and s is greater than p and if the sum of r and s is greater than the sum of p and q print "Correct values", otherwise print "Wrong values".

Exercise 3:

1. Write a C program to convert a string to a long integer.
2. Write a program in C which is a Menu-Driven Program to compute the area of the various geometrical shape.
3. Write a C program to calculate the factorial of a given number

Exercise 4:

1. Write a program in C to display the n terms of even natural number and their sum.
2. Write a program in C to display the n terms of harmonic series and their sum. $1 + 1/2 + 1/3 + 1/4 + 1/5 \dots 1/n$ terms.
3. Write a C program to check whether a given number is an Armstrong number or not.

Exercise 5:

1. Write a program in C to print all unique elements in an array.
2. Write a program in C to separate odd and even integers in separate arrays.
3. Write a program in C to sort elements of array in ascending order.

Exercise 6:

1. Write a program in C for multiplication of two square Matrices.
2. Write a program in C to find transpose of a given matrix.

Exercise 7:

1. Write a program in C to search an element in a row wise and column wise sorted matrix.
2. Write a program in C to print individual characters of string in reverse order.

Exercise 8:

1. Write a program in C to compare two strings without using string library functions.
2. Write a program in C to copy one string to another string.

Exercise 9:

1. Write a C Program to Store Information Using Structures with Dynamically Memory Allocation
2. Write a program in C to demonstrate how to handle the pointers in the program.

Exercise 10:

1. Write a program in C to demonstrate the use of & (address of) and *(value at address) operator.
2. Write a program in C to add two numbers using pointers.

Exercise 11:

1. Write a program in C to add numbers using call by reference.
2. Write a program in C to find the largest element using Dynamic Memory Allocation.

Exercise 12:

1. Write a program in C to swap elements using call by reference.

2. Write a program in C to count the number of vowels and consonants in a string using a pointer.

Exercise 13:

1. Write a program in C to show how a function returning pointer.
2. Write a C program to find sum of n elements entered by user. To perform this program, allocate memory dynamically using malloc() function.

Exercise 14:

1. Write a C program to find sum of n elements entered by user. To perform this program, allocate memory dynamically using calloc() function. Understand the difference between the above two programs
2. Write a program in C to convert decimal number to binary number using the function.

Exercise 15:

1. Write a program in C to check whether a number is a prime number or not using the function.
2. Write a program in C to get the largest element of an array using the function.

Exercise 16:

1. Write a program in C to append multiple lines at the end of a text file.
2. Write a program in C to copy a file in another name.
3. Write a program in C to remove a file from the disk.

TEXT BOOKS:

[1] Behrouz A. Forouzan & Richard F. Gilberg , –"Computer Science A Structured Programming Approach using C" , CENGAGE Learning, Third Edition.

REFERENCE BOOKS:

[1]Kernighan and Ritchie , –"The C programming language" , The (Ansi C Version), PHI second edition.

[2]Yashwant Kanetkar , –"Let us C" , BPB Publications, 2nd Edition 2001.

[3]Paul J. Dietel and Dr. Harvey M. Deitel, –"C: How to Program", Prentice Hall, 7 th edition (March 4,2012).

[4]Herbert Schildt, –"C:The Complete reference", McGraw Hill, 4th Edition, 2002.

[5]K.R.Venugopal, Sundeep R Prasad, –"Mastering C", McGraw Hill, 2nd Edition, 2015

E-RESOURCES:

1.<http://cslibrary.stanford.edu/101/EssentialC.pdf>

2. <http://nptel.ac.in/courses/106104128/>

3.http://www.vssut.ac.in/lecture_notes

**20A1201491-BUILDING PLANNING AND COMPUTER AIDED ENGINEERING
DRAWING**

Lecture – Lab:	1-3 Hours	Internal Marks:	30
Credits:	2	External Marks:	70

Prerequisites:**Course Objectives:**

To help the student to attain competency in preparation of engineering drawings as per principles of planning using a suitable CAD software through various teaching learning experiences.

Course Outcomes:**Upon successful completion of the course, the student will be able to:**

CO1	Perform basic commands of any suitable CAD software to draw 2D
CO2	Interpret the conventions, signs and symbols from a given drawing.
CO3	Prepare line plans of residential and public buildings using principles of planning.
CO4	Prepare submission and working drawing from the given requirement for Load Bearing and Framed structures

Contribution of Course Outcomes towards achievement of Program**Outcomes (1 – Low, 2- Medium, 3 – High)**

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	3	3	-	3	-	2	-	2	-	-	-	-
CO2	3	3	-	3	-	2	-	2	-	-	-	-
CO3	3	3	-	3	-	2	-	2	-	-	-	-
CO4	3	3	-	3	-	2	-	2	-	-	-	-

List of Experiments**WEEK 1, 2 and 3**

Introduction to CAD software: Basic commands of CAD to draw, modify 2D drawings

Building Byelaws: Introduction – Terminology – Objectives of building byelaws – Principles under laying building bye laws – Types of Buildings.

Regulations: Introduction – Development Control Rules of buildings – General Building

Requirements as per NBC – Open space, Lighting and ventilation requirements – Floor area ratio & Floor space index.

Conventions, signs and symbols: Conventions as per IS 962-1989, signs and symbols for earthwork, brickwork, stonework, concrete, woodwork and glass used in civil engineering. Construction, Graphical symbols for door and window, Abbreviations, symbols for sanitary and electrical installations.

Types of lines and scales: Types of lines- visible lines, centre line, hidden line, section line, dimension line, extension line, pointers, arrow head or dots. Appropriate size of lettering and numerals for Titles, sub titles, notes and dimensions.

Types of scale- Monumental, Intimate, criteria for Proper Selection of scale for various types of drawing. Sizes of various standard papers/sheets.

Exercise 0

Prepare a given line drawing in minimum three layers using CAD software.

Exercise 1

Reading and interpreting readymade Architectural building drawing (To be procured from Architect, Planning Consultants, Planning Engineer)

WEEK 4, 5 and 6

Principles of building planning: Introduction to buildings, Classification of

Buildings, Building Components, Orientation of building, Principles of architecture composition

Principles of planning of Residential and Public building, Orientation of building and Principles of architecture composition: Aspect, Prospect Orientation, Grouping, Privacy, Elegance, Flexibility. Roominess, Circulation, Furniture requirements, Sanitation, Ventilation, Illumination and Economy.

Space requirements and bye-laws: Space requirement and norms for minimum dimension of different units in the residential and public buildings as per IS 962-1989. Rules and bye-laws of sanctioning authorities for construction work. Plot area, built up area, super built-up area, plinth area, carpet area, floor area and FAR (Floor Area Ratio) / FSI.

Exercise 2

Line plans for residential building of minimum three rooms including w/c, bath and staircase as per principles of planning.

Exercise 3

Line plans for public building-school building, primary health centre, restaurant, bank, post office, hostel, Function Hall and Library.

WEEK 7, 8, 9 and 10

Drawing of Load Bearing Structure: Developed plan, elevation, section, site plan, schedule of openings construction notes with specifications, area statement. Planning and design of staircase Rise and Tread for residential and public building (2 BHK Load bearing structure). Component parts of the given load bearing structure

Exercise 4

Draw developed plan, elevation, section, site plan from the given line plan for a load bearing residential building (2BHK) with stair case.

Exercise 5

Prepare submission drawing (including foundation plan) of the given load bearing residential building with stair case.

WEEK 11, 12, 13 and 14

Drawing of Framed Structure: Developed plan, elevation, section, site plan, schedule of openings construction notes with specifications, area statement. Planning and design of staircase Rise and Tread for residential and public building (G+1, 2 BHK framed structure). Component parts of the given framed structure

Exercise 6

Draw developed plan, elevation, section, site plan from the given line plan for framed structure residential building including stair case (2BHK, G+1).

Exercise 7

Prepare submission drawing (including foundation plan) of the given framed structure residential building with stair case

Note: It is mandatory that student performs all 8 Exercises (from 0 to 7).



NRI INSTITUTE OF TECHNOLOGY

(An Autonomous Institution Permanently Affiliated to JNTUK, Kakinada)
(Accredited by NAAC with "A" Grade and ISO 9001:2015 Certified Institution)
POTHAVARAPPADU (V), (VIA) NUNNA, AGIRIPALLI (M), PIN – 521 212

DEPARTMENT OF CIVIL ENGINEERING

STRUCTURE FOR SECOND YEAR B.TECH PROGRAMME

II YEAR I SEMESTER

Sl. No	Course Code	Title of the Course	Scheme of Instruction (Periods Per Week)				Scheme of Examination (Maximum Marks)			No. of Credits
			L	T	P	Total	CIA	SEA	Total	
1	20A2100201	Vector calculus, Fourier Transforms and Partial Differential Equations	2	1	0	3	30	70	100	3
2	20A2101401	Strength of Materials - I	2	1	0	3	30	70	100	3
3	20A2101402	Fluid Mechanics	2	1	0	3	30	70	100	3
4	20A2101403	Surveying and Geometrics	2	1	0	3	30	70	100	3
5	20A2101404	Highway Engineering	2	1	0	3	30	70	100	3
6	20A2101491	Concrete Technology Lab	0	0	3	3	15	35	50	1.5
7	20A2101492	Highway Engineering Lab	0	0	3	3	15	35	50	1.5
8	20A2101493	Surveying Field Work – I (Lab)	0	0	3	3	15	35	50	1.5
9	20A2101991	Land Surveying & Building Materials	1	0	2	3	--	50	50	1.5
10	20A2100801	Constitution of India	2	0	0	2	30	70	100	0
Total			13	5	11	29	225	575	800	21

II YEAR II SEMESTER

Sl. No	Course Code	Title of the Course	Scheme of Instruction (Periods Per Week)				Scheme of Examination (Maximum Marks)			No. of Credits
			L	T	P	Total	CIA	SEA	Total	
1	20A2200201	Probability and Statistics	2	1	0	3	30	70	100	3
2	20A2201401	Strength of Materials -II	2	1	0	3	30	70	100	3
3	20A2201301	Hydraulics and Hydraulic Machinery	2	1	0	3	30	70	100	3
4	20A2201402	Environmental Engineering	2	1	0	3	30	70	100	3
5	20A2201403	Engineering Geology (Integrated Theory & lab Course)	2	1	0	3	30	70	100	3
6	20A2200101	Managerial Economics & Financial Analysis	2	1	0	3	30	70	100	3
7	20A2201491	Environmental Engineering Lab	0	0	3	3	15	35	50	1.5
8	20A2201492	Strength of Material Lab	0	0	3	3	15	35	50	1.5
9	20A2201493	Fluid Mechanics & Hydraulics Machinery Lab	0	0	3	3	15	35	50	1.5
10	20A2201991	Field Studies & Audit Reports	1	0	2	3	--	50	50	1.5
Total			13	6	11	30	225	575	800	24

* Internal Evaluation

L - LECTURE T - TUTORIAL P - PRACTICAL

CIA – Continuous Internal Assessment SEA – Semester End Assessment

**20A2100201-VECTOR CALCULUS, FOURIER TRANSFORMS AND
PARTIAL DIFFERENTIAL EQUATIONS**

Lecture-Tutorial	2-1	Internal Marks:	30									
Credits	3	External Marks:	70									
Course Objectives:												
<ul style="list-style-type: none"> ➤ To familiarize the techniques in partial differential equations ➤ To furnish the learners with basic concepts and techniques at plus two level to lead them into advanced level by handling various real-world application 												
Course Outcomes:												
Upon successful completion of the course, the student will be able to:												
CO1	Interpret the physical meaning of different operators such as gradient, curl and divergence											
CO2	Estimate the work done against a field, circulation and flux using vector calculus											
CO3	Apply the Laplace transform for solving differential equations											
CO4	Find or compute the Fourier series of periodic signals											
CO5	Know and be able to apply integral expressions for the forwards and inverse Fourier transform to arrange of non-periodic wave forms											
CO6	Identify solution methods for partial differential equations that model physical processes											
Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – High)												
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	3	3	2	2	-	-	-	-	-	-	-	-
CO2	3	3	2	2	-	-	-	-	-	-	-	-
CO3	3	3	2	2	-	-	-	-	-	-	-	-
CO4	3	3	2	2	-	-	-	-	-	-	-	-
CO5	3	3	2	2	-	-	-	-	-	-	-	-
CO6	3	3	2	2	-	-	-	-	-	-	-	-
UNIT I												
Vector calculus:												
Vector Differentiation: Gradient –Directional derivative–Divergence–Curl–Scalar Potential. Vector Integration: Line integral–Work done–Area–Surface and volume integrals.												
Vector integral theorems: Greens, Stokes and Gauss Divergence theorems (without proof)												
UNIT II												

Laplace Transforms:

Laplace transforms of standard functions – Shifting theorems – Transforms of derivatives and integrals – Inverse Laplace transforms– Convolution theorem (without proof).

Applications:

Solving ordinary differential equations (initial value problems) using Laplace transforms

UNIT III**Fourier series and Fourier Transforms:****Fourier Series:**

Introduction – Periodic functions – Fourier series of periodic function –Dirichlet's conditions – Even and odd functions – Change of interval – Half-range sine and cosine series.

Fourier Transforms:

Fourier integral theorem (without proof) –Fourier sine and cosine integrals –Sine and cosinetransforms –inverse trans forms –Finite Fourier transforms

UNIT IV**PDE of first order:**

Formation of partial differential equations by elimination of arbitrary constants and arbitrary functions – Solutions of first order linear (Lagrange) equation and nonlinear (standard types) equations.

UNIT: V**Second order PDE:**

Second order PDE: Solutions of linear partial differential equations with constant coefficient –RH term of the type $\frac{\partial^2 z}{\partial x^2} + \frac{\partial^2 z}{\partial y^2}$, $\frac{\partial^2 z}{\partial x^2} + \frac{\partial^2 z}{\partial y^2} + \frac{\partial z}{\partial x}$, $\frac{\partial^2 z}{\partial x^2} + \frac{\partial^2 z}{\partial y^2} + \frac{\partial z}{\partial y}$.

Method of separation of variables – introduction.

TEXT BOOKS:

- 1.B.S.Grewal, Higher Engineering Mathematics, 43rd Edition, Khanna Publishers.
2. B.V.Ramana, Higher Engineering Mathematics, 2007 Edition, Tata Mc.Graw Hill Education

REFERENCE BOOKS:

1. ErwinKreyszig, Advanced Engineering Mathematics, 10thEdition, Wiley-India.
2. Dean. G. Duffy, Advanced Engineering Mathematics with MATLAB, 3rdEdition, CRC Press.
3. Peter O'Neil, Advanced Engineering Mathematics, Cengage.
4. Srimantha Pal, SCBhunia, Engineering Mathematics, Oxford University Press

E-RESOURCES:

- 1.www.nptelvideos.com/mathematics/ (Math Lectures from MIT, Stanford,IIT'S)
- 2.nptel.ac.in/courses/122107
- 3.nptel.ac.in/courses/111105

20A2101401-STRENGTH OF MATERIALS - I

Lecture – Tutorial:	3-0 Hours	Internal Marks:	30									
Credits:	3	External Marks:	70									
Prerequisites: Engineering Physics, Engineering Mechanics												
Course Objectives:												
1. To impart preliminary concepts of Strength of Material and Principles of Elasticity and Plasticity Stress conditions and to develop diagrams of variation of various stresses across the length.												
2. To give concepts of stresses developed in the cross section and bending equations calculation of section modulus of sections with different cross sections												
3. The concepts above will be utilized in measuring deflections in beams under various loading and support conditions												
4. To classify cylinders based on their thickness and to derive equations for measurement of stresses across the cross section when subjected to external pressure.												
Course Outcomes:												
Upon successful completion of the course, the student will be able to:												
CO1	Understand the basic materials behaviour under the influence of different external loading conditions and the support conditions											
CO2	Draw the diagrams indicating the variation of the key performance features like bending moment and shear forces											
CO3	Knowledge of bending concepts and calculation of section modulus											
CO4	Determine the stresses developed in the beams and deflections due to various loading conditions											
CO5	Assess stresses across section of the thin cylinders to arrive at optimum sections to withstand the internal pressure using Lamé's equation.											
CO6	Assess stresses across section of the thick cylinders to arrive at optimum sections to withstand the internal pressure using Lamé's equation.											
Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – High)												
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	3	-	-	-	-	-	-	-	-	-	-	-
CO2	3	2	-	-	-	-	-	-	-	-	-	-
CO3	3	1	-	-	-	-	-	-	-	-	-	-
CO4	1	3	-	-	-	-	-	-	-	-	-	-
CO5	3	3	-	1	-	-	-	-	-	-	-	-
CO6	3	3	-	1	-	-	-	-	-	-	-	-
UNIT I												
Simple Stresses and Strains: Elasticity and plasticity – Types of stresses and strains– Hooke's law – stress – strain diagram for mild steel – Working stress – Factor of safety – Lateral strain, Poisson's ratio and volumetric strain – Elastic moduli and the relationship between them – Bars of varying section – stresses in composite bars – Temperature stresses.												
Strain Energy – Resilience – Gradual, sudden, impact and shock loadings – simple applications.												
UNIT II												

Shear Force and Bending Moment: Definition of beam – Types of beams – Concept of shear force and bending moment – Point of contra flexure – Relation between S.F., B.M and rate of loading at a section of a beam; S.F and B.M diagrams for cantilever, simply supported and overhanging beams subjected to point loads, uniformly distributed loads, uniformly varying loads, partial uniformly distributed loads, couple and combination of these loads.

UNIT III

Flexural and shear Stresses in beams

Flexural Stresses: Theory of simple bending – Assumptions – Derivation of bending equation: $M/I = f/y = E/R$, Neutral axis – Determination bending stresses – section modulus of rectangular and circular sections (Solid and Hollow), I, T, Angle and Channel sections – Design of simple beam sections.

Shear Stresses: Derivation of formula – Shear stress distribution across various beam sections likerectangular, circular, I, T Angle sections.

UNIT IV

Deflection of Beams: Bending into a circular arc – slope, deflection and radius of curvature – Differential equation for the elastic curve of a beam – Double integration and Macaulay's methods – Determination of slope and deflection for cantilever, simply supported and overhanging beams subjected to point loads, uniformly distributed loads, uniformly varying loads, partial uniformly distributed loads, couple and combination of these loads. Mohr's theorems – Moment area method – application to simple cases of cantilever.

UNIT V

Thin and Thick Cylinders:

Thin cylindrical shells – Derivation of formula for longitudinal and circumferential stresses – hoop, longitudinal and volumetric strains – changes in diameter, and volume of thin cylinders.

Thick cylinders: Introduction: Lames theory for thick cylinders, Derivation of Lames formulae, distribution of hoop and radial stresses across the thickness, compound cylinders-distribution of stresses.

TEXT BOOKS:

1. A Textbook of Strength of Materials, by R. K. Rajput, 7e (Mechanics of Solids) SI Units S.Chand & Co, New Delhi
2. Strength of materials by R. K. Bansal, Lakshmi Publications.

REFERENCE BOOKS:

1. Mechanics of Materials- by R. C.Hibbler, Pearson publishers
2. Mechanics of Solids – E P Popov, Prentice Hall.
3. Strength of Materials by B.S.Basavarajaiah and P. Mahadevappa, 3rd Edition, UniversitiesPress
4. Mechanics of Structures Vol – I by H.J.Shah and S.B.Junnarkar, Charotar Publishing HousePvt. Ltd.

E-RESOURCES:

- <http://www.btechmaterials.com/download/strength-materials-ii-materials-notes/>
- <http://www.nptelvideos.in/2012/11/mechanics-of-solids.html>
- <http://www.nptelvideos.in/2012/11/strength-of-materials-prof.html>
 - <http://www.btechmaterials.com/download/strength-materials-materials-notes/>

20A2101402-FLUID MECHANICS

Lecture – Tutorial:	3-0 Hours	Internal Marks:	30
Credits:	3	External Marks:	70

Prerequisites:**Course Objectives:**

1. To understand the properties of fluids and fluid statics
2. To derive the equation of conservation of mass and its application
3. To solve kinematic problems such as finding particle paths and streamlines
4. To use important concepts of continuity equation, Bernoulli's equation and turbulence, and apply the same to problems
5. To analyze laminar and turbulent flows
6. To understand the various flow measuring devices
7. To study in detail about boundary layers theory

Course Outcomes:**Upon successful completion of the course, the student will be able to:**

C01	Explain the various properties of fluids and their influence on fluid motion
C02	Analyze a variety of problems in fluid statics and dynamics.
C03	Calculate the forces that act on submerged planes and curves.
C04	Analyze various types of fluid flows.
C05	Apply the integral forms of the three fundamental laws of fluid mechanics to turbulent and laminar flow through pipes and ducts in order to predict relevant pressures, velocities and forces.
C06	Measure the quantities of fluid flowing in pipes, tanks and channels.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
C01	3	-	-	-	-	2	-	1	-	-	-	-
C02	3	-	-	-	-	-	-	-	-	-	-	-
C03	3	-	-	-	-	-	-	-	-	-	-	-
C04	3	2	-	3	-	-	-	2	-	-	-	-
C05	2	2	-	3	-	-	-	2	-	-	-	-
C06	2	2	-	2	-	-	-	-	-	-	-	-

UNIT I

Dimensions and units – Physical properties of fluids - specific gravity, viscosity, surface tension, vapour pressure and their influences on fluid motion, pressure at a point, Pascal's law, Hydrostatic law -atmospheric, gauge and vacuum pressures-measurement of pressure. Pressure gauges, Manometers: Differential and Micro Manometers.

Hydrostatics: Hydrostatic forces on submerged plane, Horizontal, Vertical, inclined and curved surfaces – Centre of pressure.

UNIT II

Fluid Kinematics: Description of fluid flow, Stream line, path line and streak line and stream tube. Classification of flows: Steady, unsteady, uniform, non-uniform, laminar, turbulent, rotational and irrotational flows – Equation of continuity for one, two , three dimensional flows – stream and velocity potential functions, flow net analysis.

Fluid Dynamics: Surface and body forces – Euler's and Bernoulli's equations for flow along a stream line - Momentum equation and its application – forces on pipe bend

UNIT III

Laminar Flow and Turbulent Flows: Reynold's experiment – Characteristics of Laminar & Turbulent flows, Shear and velocity distributions, Laws of Fluid friction,

Hagen-Poiseulle Formula, Flow between parallel plates, Flow through long tubes, hydro-dynamically smooth and rough flows.

Closed Conduit Flow: Darcy-Weisbach equation, Minor losses – pipes in series – pipes in parallel – Total energy line and hydraulic gradient line, variation of friction factor with Reynold's number – Moody's Chart, Pipe network problems, Hazen-Williams formula, Hard-Cross Method,

UNIT IV

Measurement of Flow: Pitot tube, Venturi meter and Orifice meter – classification of orifices, small orifice and large orifice, flow over rectangular, triangular, trapezoidal and Stepped notches, Broad crested weirs and Ogee weirs

UNIT V

Boundary Layer Theory: Boundary layer (BL) – concepts, Prandtl contribution, Characteristics of boundary layer along a thin flat plate, Vonkarman momentum integral equation, laminar and turbulent Boundary layers (no deviations)- BL in transition, separation of BL, Control of BL, flow around submerged objects-Drag and Lift- Magnus effect.

TEXT BOOKS:

1. "Fluid mechanics", Standard book house, New Delhi, Modi P.N and Seth S.M.(2018),
2. A text of Fluid mechanics and hydraulic machines, R.K.Bansal- Laxmi Publications (P) ltd., New Delhi

REFERENCE BOOKS:

1. Fluid mechanics and hydraulic machines Mc graw hill education, IInd edition, K.Subramanyam
2. Fluid Mechanics and Machinery, C.S.P. Ojha, R. Berndtsson and P.N. Chandramouli, OxfordHigher Education.
3. Principle of fluid mechanics and fluid machines III edition, university press

E-RESOURCES:

- <http://www.btechmaterials.com/download/fluid-mechanics-fm-materials-notes/>
- <http://www.nptelvideos.in/2012/11/fluid-mechanics.html>

20A2101403-SURVEYING AND GEOMETRICS

Lecture – Tutorial:	3-0 Hours	Internal Marks:	30
Credits:	3	External Marks:	70

Prerequisites: Basic Civil Engineering Workshop**Course Objectives:**

1. Know the principle and methods of surveying.
2. Measure horizontal and vertical- distances and angles
3. Recording of observation accurately
4. Perform calculations based on the observation
5. Identification of source of errors and rectification methods
6. Apply surveying principles to determine areas and volumes and setting out curves
7. Use modern surveying equipment's for accurate results

Course Outcomes:**Upon successful completion of the course, the student will be able to:**

C01	Apply the knowledge to calculate angles, distances and levels
C02	Identify data collection methods and prepare field notes
C03	Explain the working principles of survey instruments, measurement errors and corrective measures
C04	Interpret survey data and compute areas and volumes,
C05	levels by different type of equipment
C06	Relate the knowledge to the modern equipment and methodologies

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
C01	3	3	-	-	1	-	-	-	-	-	-	-
C02	2	3	-	-	1	-	-	-	-	-	-	-
C03	2	3	-	1	-	-	-	-	-	-	-	-
C04	2	3	-	-	1	-	-	-	-	-	-	-
C05	2	3	-	-	1	-	3	1	-	-	-	-
C06	2	-	-	-	-	-	2	1	-	-	-	-

UNIT I

Basic Concepts: Introduction, Objectives, classification and principles of surveying, surveying accessories. Introduction to Compass, levelling and Plane table surveying.

Measurement of Distances and Directions

Linear distances-Approximate methods, Direct Methods- Chains- Tapes, ranging, Tape corrections. **Prismatic Compass-** Bearings, included angles, Local Attraction, Magnetic Declination, and dip -W.C.B systems and Q.B. system of locating bearings.

UNIT II

Leveling- Types of levels, temporary and permanent adjustments, methods of levelling, booking and Determination of levels, Effect of Curvature of Earth and Refraction.

Contouring- Characteristics and uses of Contours, methods of contour surveying.

Areas - Determination of areas consisting of irregular boundary and regular boundary.

Volumes -Determination of volume of earth work in cutting and embankments for level section, volume of borrow pits, capacity of reservoirs.

UNIT III

Theodolite Surveying: Types of Theodolites, temporary adjustments, measurement of horizontal angle by repetition method and reiteration method, measurement of vertical Angle, Trigonometric levelling when base is accessible and inaccessible.

UNIT IV

Tachometric Surveying: Principles of Tachometry, stadia and tangential methods of Tachometry

Traversing: Methods of traversing, traverse computations and adjustments, Introduction to Omitted measurements.

UNIT V

Curves: Types of curves and their necessity, elements of simple, compound, reverse curves.

Modern Surveying Methods: Principle and types of E.D.M. Instruments, Total station- advantages and Applications. Introduction to Global Positioning System.

TEXT BOOKS:

1. Surveying (Vol – 1, 2 & 3), by B. C. Punmia, Ashok Kumar Jain and Arun Kumar Jain -Laxmi Publications (P) ltd., New Delhi.
2. “Plane Surveying and higher surveying”, Chandra A M, New Age International Pvt. Ltd., Publishers, New Delhi.
3. “Surveying (Vol – 1 & 2), Duggal S K, Tata McGraw Hill Publishing Co. Ltd. New Delhi.

REFERENCE BOOKS:

1. Elements of Plane Surveying, Arthur R Benton and Philip J Taety McGraw Hill.
2. Surveying and levelling by R. Subramanian, Oxford university press, New Delhi
3. “Surveying Vol 1, 2 & 3), Arora K R, Standard Book House, Delhi.

E-RESOURCES:

- <http://www.btechmaterials.com/download/surveying-materials-notes/>
- <http://www.nptelvideos.in/2012/11/modern-surveying-techniques.html>
- <http://www.nptelvideos.in/2012/11/surveying.html>
- <http://nptel.ac.in/courses/105104101/>

20A2101404-HIGHWAY ENGINEERING

Lecture – Tutorial:	3-0 Hours	Internal Marks:	30
Credits:	3	External Marks:	70

Prerequisites: Building Materials, Concrete Technology

Course Objectives:

- To impart different concepts in the field of Highway Engineering.
- To acquire design principles of Highway Geometrics and Pavements
- To acquire design principles of Intersections

Course Outcomes:

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

C01	Plan highway network for a given area.
C02	Determine Highway alignment
C03	Design highway geometrics.
C04	Design Intersections and prepare traffic management plans
C05	Judge suitability of pavement materials
C06	Design flexible and rigid pavements

**Contribution of Course Outcomes towards achievement of Program Outcomes
(1 – Low, 2- Medium, 3 – High)**

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
C01	2	-	-	-	-	-	-	-	-	-	-	-
C02	2	-	-	-	-	-	-	-	-	-	-	-
C03	2	3	3	-	-	2	-	1	-	-	-	-
C04	2	3	3	-	-	2	-	1	-	-	-	-
C05	2	3	3	-	-	2	-	1	-	-	-	-
C06	2	3	3	-	-	2	-	1	-	-	-	-

UNIT I

Highway Planning and Alignment: Highway development in India; Classification of Roads; Road Network Patterns; Necessity for Highway Planning; Different Road Development Plans– First, second, third road development plans, road development vision 2021, Rural Road Development Plan – Vision 2025; Planning Surveys; Highway Alignment- Factors affecting Alignment- Engineering Surveys – Drawings and Reports.

UNIT II

Highway Geometric Design: Importance of Geometric Design- Design controls and Criteria- Highway Cross Section Elements- Sight Distance Elements- Stopping sight Distance, Overtaking Sight Distance and Intermediate Sight Distance- Design of Horizontal Alignment- Design of Super elevation and Extra widening- Design of Transition Curves- Design of Vertical alignment- Gradients- Vertical curves.

UNIT III

Traffic Engineering: Basic Parameters of Traffic-Volume, Speed and Density- Traffic Volume Studies; Speed studies –spot speed and speed & delay studies; Parking Studies; Road Accidents-Causes and Preventive measures - Condition Diagram and Collision Diagrams; PCU Factors, Capacity of Highways – Factors Affecting; LOS Concepts; Road Traffic Signs; Road markings; Types of Intersections; At-Grade Intersections – Design of Plain, Flared, Rotary and Channelized Intersections; Design of Traffic Signals – Webster Method – IRC Method.

UNIT IV

Highway Materials: Subgrade soil: classification – Group Index – Subgrade soil strength-California Bearing Ratio – Modulus of Subgrade Reaction. Stone aggregates: Desirable properties – Tests for Road Aggregates – Bituminous Materials: Types –

Desirable properties – Tests on Bitumen-Bituminous paving mixes: Requirements – Marshall Method of Mix Design.

UNIT V

Design of Pavements: Types of pavements; Functions and requirements of different components of pavements; Design Factors

Flexible Pavements: Design factors – Flexible Pavement Design Methods – CBR method – IRC method – Burmister method – Mechanistic method – IRC Method for Low volume Flexible pavements.

Rigid Pavements: Design Considerations – wheel load stresses – Temperature stresses – Frictional stresses – Combination of stresses – Design of slabs – Design of Joints – IRC method – Rigid pavements for low volume roads – Continuously Reinforced Cement Concrete Pavements – Roller Compacted Concrete Pavements.

TEXT BOOKS:

1. Highway Engineering, Khanna S. K., Justo C. E. G and Veeraragavan A, Nem Chand Bros., Roorkee.
2. Traffic Engineering and Transportation Planning, Kadiyali L. R, Khanna Publishers, New Delhi.

REFERENCE BOOKS:

1. Principles of Highway Engineering, Kadiyali L. R, Khanna Publishers, New Delhi
2. Principles of Transportation Engineering, Partha Chakroborthy and Animesh Das, PHI Learning Private Limited, Delhi

E-RESOURCES:

- <https://www.alljntuworld.in/download/transportation-engineering-ii-materials-notes/>
- <http://www.nptelvideos.in/2012/11/transportation-engineering-ii.html>
- <http://www.nptelvideos.in/2012/11/urban-transportation-planning.html>
- <http://www.nptelvideos.in/2012/11/transportation-engineering-ii.html>

20A2101491-CONCRETE TECHNOLOGY LAB

Labs / Instructions Hours/Week	3 Hours	Internal Marks:	15									
Credits:	1.5	External Marks:	35									
Prerequisites: Concrete Technology												
Course Objectives:												
To study basic properties ingredients of concrete, fresh and hardened concrete properties												
Course Outcomes:												
Upon successful completion of the course, the student will be able to:												
C01	Determine the properties of the constituent materials of concrete.											
C02	Test and evaluate properties of fresh concrete and the properties of hardened concrete including strength and durability.											
Contribution of Course Outcomes towards achievement of Program Outcomes (1 - Low, 2- Medium, 3 - High)												
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
C01	3	3	-	3	-	2	-	2	-	-	-	-
C02	3	3	-	3	-	2	-	2	-	-	-	-
List of Experiments												
<ol style="list-style-type: none"> 1. Determination of normal Consistency and fineness of cement. 2. Determination of initial setting time and final setting time of cement. 3. Determination of specific gravity and soundness of cement. 4. Determination of compressive strength of cement. 5. Determination of grading and fineness modulus of coarse aggregate by sieve analysis. 6. Determination of specific gravity of coarse aggregate 7. Determination of grading and fineness modulus of fine aggregate (sand) by sieve analysis. 8. Determination of bulking of sand. 9. Determination of workability of concrete by compaction factor method. 10. Determination of workability of concrete by slump test 11. Determination of workability of concrete by Vee-bee test. 12. Determination of compressive strength of cement concrete and its young's modulus 13. Determination of split tensile strength of concrete. 14. Non-Destructive testing on concrete (for demonstration) 												
Note: At least 10 experiments must be conducted (at least one for each property)												
TEXT BOOKS:												
<ol style="list-style-type: none"> 1. Properties of Concrete by A. M. Neville, ELBS publications Oct 1996. 2. Concrete Technology by M.S. Shetty, S.Chand & Co 2009. 												
REFERENCE BOOKS:												
<ol style="list-style-type: none"> 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. 												
E-RESOURCES												
vlab.co.in												

20A2101492-HIGHWAY ENGINEERING LAB

Labs / Instructions Hours/Week	3 Hours	Internal Marks:	15
Credits:	1.5	External Marks:	35

Prerequisites: Highway Engineering**Course Objectives:**

- To test crushing value, impact resistance, specific gravity and water absorption, attrition value, abrasion value, flakiness index and elongation index for the given road aggregates.
- To know penetration value, ductility value, softening point, flash and fire point, viscosity and stripping for the given bitumen grade.
- To test the stability for the given bituminous mix
- To carry out surveys for traffic volume, speed and parking.

Course Outcomes:**Upon successful completion of the course, the student will be able to:**

CO1	Test aggregates and judge the suitability of materials for the road construction
CO2	Test the given bitumen samples and judge their suitability for the road construction
CO3	Obtain the optimum bitumen content for Bituminous Concrete
CO4	Determine the traffic volume, speed and parking characteristics.
CO5	Draw highway cross sections and intersections.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	3	3	-	3	-	2	-	2	-	-	-	-
CO2	3	3	-	3	-	2	-	2	-	-	-	-
CO3	3	3	-	3	-	2	-	2	-	-	-	-
CO4	3	3	-	3	-	2	-	2	-	-	-	-
CO5	3	3	-	3	-	2	-	2	-	-	-	-

List of Experiments**ROAD AGGREGATES:**

- a. Aggregate Crushing value Test
- b. Aggregate Impact Test.
- c. Specific Gravity and Water Absorption Test
- d. Attrition Test
- e. Abrasion Test.
- f. Shape tests

BITUMINOUS MATERIALS:

- a. Penetration Test.
- b. Ductility Test.
- c. Softening Point Test.
- d. Flash and fire point tests.
- e. Stripping Test
- f. Viscosity Test.

BITUMINOUS MIX:

- a. Marshall Stability test.

TRAFFIC SURVEYS:

- a. Traffic volume study at mid blocks.
- b. Traffic Volume Studies (Turning Movements) at intersection.

c. Spot speed studies.

d. Parking study.

DESIGN & DRAWING

a. Earthwork calculations for road works

b. Drawing of road cross sections

c. Rotary intersection design

TEXT BOOKS:

1. 'Highway Material Testing Manual' by S.K. Khanna, C.E.G Justo and A.Veeraraghavan, Neam Chan Brothers New Chand Publications, New Delhi.

2. Highway Material Testing & Quality Control by Rao Wiley India pvt. Ltd., Noida, New Delhi

REFERENCE BOOKS:

1. IRC Codes of Practice

2. Asphalt Institute of America Manuals

3. Code of Practice of B.I.S.

E-RESOURCES

vlab.co.in

20A2101493- SURVEYING FIELD WORK-I (LAB)

Labs / Instructions Hours/Week	3 Hours	Internal Marks:	15									
Credits:	1.5	External Marks:	35									
Prerequisites: Basic Civil Engineering Workshop, Surveying & Geometrics												
Course Objectives:												
➤ To impart the practical knowledge in the field, it is essential to introduce in Curriculum. Drawing of Plans and Maps and determining the area are pre requisites before taking up any Civil Engineering works.												
Course Outcomes:												
Upon successful completion of the course, the student will be able to:												
CO1	Conduct survey and collect field data.											
CO2	Prepare field notes from survey data											
CO3	Interpret survey data and compute areas and volumes.											
Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – High)												
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	2	3	-	1	1	-	-	-	-	-	-	2
CO2	2	1	-	1	1	-	-	-	-	-	-	-
CO3	2	3	-	2	1	-	-	-	-	-	-	2
List of Experiments												
<ol style="list-style-type: none"> Survey by chain survey of road profile with offsets in case of road widening. Survey in an area by chain survey (Closed circuit) Determination of distance between two inaccessible points by using compass. Finding the area of the given boundary using compass (Closed Traverse) Plane table survey; finding the area of a given boundary by the method of Radiation Plane table survey; finding the area of a given boundary by the method of intersection. Two Point Problem by the plane table survey. Fly levelling : Height of the instrument method (differential levelling) Fly levelling: rise and fall method. Fly levelling: closed circuit/ open circuit. Fly levelling; Longitudinal Section and Cross sections of a given road profile. Fly levelling and Fly chaining (complete field work). 												
TEXT BOOKS:												
<ol style="list-style-type: none"> Surveying (Vol – 1, 2 & 3), by B. C. Punmia, Ashok Kumar Jain and Arun Kumar Jain -Laxmi Publications (P) ltd., New Delhi. “Plane Surveying and higher surveying”, Chandra A M, New Age International Pvt. Ltd.,Publishers, New Delhi. “Surveying (Vol – 1 & 2), Duggal S K, Tata McGraw Hill Publishing Co. Ltd. New Delhi. 												
REFERENCE BOOKS:												
<ol style="list-style-type: none"> Elements of Plane Surveying, Arthur R Benton and Philip J Taety McGraw Hill. Surveying and levelling by R. Subramanian, Oxford university press, New Delhi “Surveying Vol 1, 2 & 3), Arora K R, Standard Book House, Delhi. 												
E-RESOURCES												
http://nptel.ac.in/video.php?subjectId=105104101												

20A2101991- LAND SURVEYING & BUILDING MATERIALS

Practical	3 Hours	Internal Marks:	15
Credits:	1.5	External Marks:	35

Prerequisites: Surveying, Building Materials

Course Content

Topographic Survey with contour map (Total station/ DGPS)

(OR)

Masonry 3' height with different bonds and different thickness

Evaluation of Skill Oriented Course

Skill Oriented Course shall be evaluated for a total of 50 marks. Of 50 marks, 15marks shall be awarded by an internal committee consisting of two faculty members based on the presentation given and work carried out by a student and the remaining 35 marks are for final Viva-Voce examination conducted by the committee consisting of an External Examiner and the Head of the Department.

20A2100801-CONSTITUTION OF INDIA

Lecture – Tutorial:	2-0 Hours	Internal Marks:	30
Credits:	2	External Marks:	70

Prerequisites: Engineering Physics, Engineering Mechanics

Course Objectives:

5. To Enable the student to understand the importance of constitution
6. To understand the structure of executive, legislature and judiciary
7. To understand philosophy of fundamental rights and duties
8. To understand the autonomous nature of constitutional bodies like Supreme Court and high court controller and auditor general of India and election commission of India.
9. To understand the central and state relation financial and administrative.

Course Outcomes:

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

C01	Apply the knowledge on directive principle of state policy & analyze the History, features of Indian constitution
C02	Explain the structure of Indian government & Differentiate between the state
C03	Analyze the role Governor and Chief Minister & explain the role of state Secretariat
C04	Compare and contrast district administration role and importance
C05	Analyze the role of Myer and elected representatives of Municipalities
C06	Know the role of Election Commission apply knowledge & Analyze role of state election commission

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
C01	3	2	-	-	-	-	-	-	-	-	-	2
C02	3	3	2	-	-	-	-	2	-	-	-	-
C03	3	-	2	-	-	-	-	-	-	-	-	2
C04	-	-	3	-	-	-	-	2	-	-	-	2
C05	3	3	2	-	-	-	-	2	-	-	-	-
C06	3	-	2	-	-	-	-	-	-	-	-	2

UNIT I

Indian Constitution: Constitution meaning of the term, Indian Constitution - Sources and constitutional history, Features - Citizenship, Preamble, Fundamental Rights and Duties, Directive Principles of State Policy

UNIT II

Union Government and its Administration Structure of the Indian Union: Federalism, Centre- State relationship, President: Role, power and position, PM and Council of ministers, Cabinet and Central Secretariat, Lok Sabha, Rajya Sabha, The Supreme Court and High Court: Powers and Functions;

UNIT III

State Government and its Administration Governor - Role and Position - CM and

Council of ministers, State Secretariat: Organisation, Structure and Function

UNIT IV

Local Administration - District's Administration Head - Role and Importance, Municipalities - Mayor and role of Elected Representative - CEO of Municipal Corporation Pachayati Raj: Functions PRI: Zila Panchayat, Elected officials and their roles, CEO Zila Panchayat: Block level Organizational Hierarchy - (Different departments), Village level - Role of Elected and Appointed officials -Importance of grass root democracy

UNIT V

Election Commission: Election Commission- Role of Chief Election Commissioner and Election Commissionerate State Election Commission:, Functions of Commissions for the welfare of SC/ST/OBC and women

TEXT BOOKS:

1. Durga Das Basu, Introduction to the Constitution of India, Prentice – Hall of India Pvt Ltd... New Delhi
2. SubashKashyap, Indian Constitution, National Book Trust

REFERENCE BOOKS:

1. J. Raj Indian Government and Politics
2. M.V. Pylee, Indian Constitution Durga Das Basu, Human Rights in Constitutional Law, Prentice – Hall of India Pvt Ltd.. New Delhi
3. Noorani, A.G., (South Asia Human Rights Documentation Centre), Challenges to Civil Right)

E-RESOURCES:

- nptel.ac.in/courses/109104074/8
- nptel.ac.in/courses/109104045/
- nptel.ac.in/courses/101104065/
- www.hss.iitb.ac.in/en/lecture-details
- www.iitb.ac.in/en/event/2nd-lecture-institute-lecture-series-indian-constitution

II-II
SYLLABUS

20A2200201-PROBABILITY AND STATISTICS

Lecture – Tutorial:	2-1 Hours	Internal Marks:	30
Credits:	3	External Marks:	70

Prerequisites:--- NIL**Course Objectives:**

- To familiarize the students with the foundations of probability and statistical methods
- To impart probability concepts and statistical methods in various applications Engineering

Course Outcomes:**Upon successful completion of the course, the student will be able to:**

CO1	Classify the concepts of data science and its importance
CO2	Interpret the association of characteristics and through the correlation and Regression tools
CO3	Make us of the concepts of probability and their applications
CO4	Apply discrete and Continuous probability distributions
CO5	Design the components of a classical hypothesis test
CO6	Infer the statistical inferential methods based on small and large sampling tests

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	3	3	2	2	--	--	--	--	--	--	--	--
CO2	3	3	2	2	--	--	--	--	--	--	--	--
CO3	3	3	2	2	--	--	--	--	--	--	--	--
CO4	3	3	2	2	--	--	--	--	--	--	-	--
CO5	3	3	2	2	--	--	--	--	--	--	-	--
CO6	3	3	2	2	--	--	--	--	--	--	--	--

UNIT I

Descriptive Statistics and Methods for Data Science : Data Science- Introduction to Statistics- Population Vs sample – Collection of Data – Primary and Secondary Data - Types of Variables : Dependent and Independent , Categorical and Continuous Variables – Data Visualization - Measures of Central Tendency - Measures of Variability (spread and variance) – Skewness and Kurtosis

UNIT II

Correlation and Curve Fitting : Correlation –Correlation Coefficient – Rank Correlation – Regression Coefficients and properties – Regression lines – Method of Least Squares – Straight line – parabola – Exponential –power curves

UNIT III

Probability and distributions: Probability and conditional probability-Bayes' theorem-Random variables- Discrete and continuous Random variables –Distribution Function-Mathematical Expectation and Variance – Binomial ,Poisson and Uniform and Normal Distributions

UNIT IV

Introduction – Population and Samples – Sampling distribution of Means and Variance (definition only) – Central limit theorem (without proof) – Representation of the normal theory distributions -- Point and Interval estimations – Maximum error of estimate. Introduction – Hypothesis – Null and Alternative Hypothesis – Type I and Type II errors – Level of significance

UNIT V

One tail and two-tail tests-Tests Concerning One Mean and Two Means (Large Samples) – Tests on Proportions. Introduction to t , χ^2 and F – Tests.

TEXT BOOKS:

- 1) Miller and Freund's, Probability and Statistics for Engineers, 7/e, Pearson, 2008.
- 2) S. C. Gupta and V.K. Kapoor, Fundamentals of Mathematical Statistics, 11/e, Sultan Chand & Sons Publications, 2012.

REFERENCE BOOKS:

- 1) Shron L. Myers, Keying Ye, Ronald E Walpole, Probability and Statistics Engineers and the Scientists, 8th Edition, Pearson 2007.
- 2) Jay I. Devore, Probability and Statistics for Engineering and the Sciences, 8th Edition, Cengage.
- 3) Sheldon M. Ross, Introduction to probability and statistics Engineers and the Scientists, 4th Edition, Academic Foundation, 2011.
- 4) Johannes Ledolter and Robert V. Hogg, Applied statistics for Engineers and Physical Scientists, 3rd Edition, Pearson, 2010.

E-RESOURCES:

Nptel

20A2201401-STRENGTH OF MATERIALS - II

Lecture – Tutorial:	2-1 Hours	Internal Marks:	30
Credits:	3	External Marks:	70

Prerequisites: Strength of Materials –I**Course Objectives:**

- To give concepts of Principal stresses and strains developed in cross section of the beams on the cross section and stresses on any inclined plane. To impart concepts of failures in the material considering different theories
- To give concepts of torsion and governing torsion equation, and there by calculate the power transmitted by shafts and springs and design the cross section when subjected to loading using different theories of failures.
- To classify columns and calculation of load carrying capacity and to assess stresses due to axial and lateral loads for different edge conditions and to calculate combined effect of direct and bending stresses on different engineering structures.
- Introduce the concept of unsymmetrical bending in beams Location of neutral axis Deflection of beams under unsymmetrical bending.

Course Outcomes:**Upon successful completion of the course, the student will be able to:**

C01	Understand the basic concepts of Principal stresses developed in a member when it is subjected to stresses along different axes and design the sections.
C02	Explain concepts of failures in the material considering different theories
C03	Assess stresses in different engineering applications like shafts, springs
C04	Assess stresses in different engineering applications like columns and struts
C05	Assess stresses due to combined effect of direct and bending stresses on different
C06	Explain the concept of unsymmetrical bending in beams Location of neutral axis Deflection of beams under unsymmetrical bending.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
C01	2	3	3	1	-	-	-	-	-	-	-	-
C02	2	2	-	1	-	-	-	-	-	-	-	-
C03	2	3	-	1	-	-	-	-	-	-	-	-
C04	2	3	-	-	-	-	-	-	-	-	-	-
C05	2	3	-	1	-	-	-	-	-	-	-	-
C06	2	3	-	1	-	-	-	-	-	-	-	-

UNIT I

Principal Stresses and Strains And Theories of Failures: Introduction – Stresses on an inclined section of a bar under axial loading – compound stresses – Normal and tangential stresses on an inclined plane for biaxial stresses – Two perpendicular normal stresses accompanied by a state of simple shear – Mohr's circle of stresses – Principal stresses and strains – Analytical and graphical solutions.

Theories of Failures: Introduction – Various Theories of failures like Maximum Principal stress theory – Maximum Principal strain theory – Maximum shear stress theory – Maximum strain energy theory – Maximum shear strain energy theory.

UNIT II

Torsion of Circular Shafts and Springs: Theory of pure torsion – Derivation of Torsion equations: $T/J = q/r = N\phi/L$ – Assumptions made in the theory of pure torsion – Torsional moment of resistance – Polar section modulus – Power

transmitted by shafts – Combined bending and torsion and end thrust – Design of shafts according to theories of failure.

Springs: Introduction – Types of springs – deflection of close and open coiled helical springs under axial pull and axial couple – springs in series and parallel.

UNIT III

Columns and Struts: Introduction – Types of columns – Short, medium and long columns – Axially loaded compression members – Crushing load – Euler's theorem for long columns- assumptions- derivation of Euler's critical load formulae for various end conditions – Equivalent length of a column – slenderness ratio – Euler's critical stress – Limitations of Euler's theory – Rankine – Gordon formula – Long columns subjected to eccentric loading – Secant formula – Empirical formulae – Straight line formula – Prof. Perry's formula.

UNIT IV

Direct and Bending Stresses: Stresses under the combined action of direct loading and B.M. Core of a section – determination of stresses in the case of chimneys, retaining walls and dams – conditions for stability – stresses due to direct loading and B.M. about both axis.

UNIT V

Unsymmetrical Bending and Shear Centre

Un-symmetrical Bending: Introduction – Centroidal principal axes of section – Graphical method for locating principal axes – Moments of inertia referred to any set of rectangular axes – Stresses in beams subjected to unsymmetrical bending – Principal axes– Resolution of bending moment into two rectangular axes through the centroid – Location of neutral axis Deflection of beams under unsymmetrical bending.

Shear Centre: Introduction Shear center for symmetrical and unsymmetrical sections (channel, I, T and L sections).

TEXT BOOKS:

1. A Textbook of Strength of Materials, by R. K. Rajput, 7e (Mechanics of Solids) SI Units S. Chand & Co, NewDelhi
2. Strength of materials by R. K. Bansal, Lakshmi Publications.

REFERENCE BOOKS:

1. Mechanics of Materials- by R. C.Hibbler, Pearson publishers
2. Mechanics of Solids – E P Popov, Prentice Hall.
3. Strength of Materials by B.S.Basavarajaiah and P. Mahadevappa, 3rd Edition, Universities Press,
4. Mechanics of Structures Vol – I by H.J.Shah and S.B.Junnarkar, Charotar Publishing House Pvt. Ltd.

E-RESOURCES:

- <http://www.btechmaterials.com/download/strength-materials-ii-materials-notes/>
- <http://www.nptelvideos.in/2012/11/mechanics-of-solids.html>
- <http://www.nptelvideos.in/2012/11/strength-of-materials-prof.html>
- <http://www.btechmaterials.com/download/strength-materials-materials-notes/>

20A2201301-HYDRAULICS AND HYDRAULIC MACHINERY

Lecture – Tutorial:	2-1 Hours	Internal Marks:	30
Credits:	3	External Marks:	70

Prerequisites: Fluid Mechanics**Course Objectives:**

- To study about uniform and non-uniform flows in open channel and also to learn about the characteristics of hydraulic jump
- To introduce dimensional analysis for fluid flow problems
- To understand the working principles of various types of hydraulic machines and Pumps

Course Outcomes:**Upon successful completion of the course, the student will be able to:**

C01	Solve uniform and non-uniform open channel flow problems.
C02	Apply the principals of dimensional analysis and similitude in hydraulic model testing
C03	Understand the working principles of various hydraulic machineries
C04	Design different types of turbines
C05	Design of centrifugal and multi stage pumps
C06	Design of reciprocating pump

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
C01	3	-	-	-	-	-	-	-	-	-	-	-
C02	3	-	-	1	-	-	2	2	-	-	-	-
C03	3	-	-	1	-	-	2	2	-	-	-	-
C04	2	-	-	3	-	-	1	2	-	-	-	-
C05	2	-	-	3	-	-	1	2	-	-	-	-
C06	2	-	-	3	-	-	1	2	-	-	-	-

UNIT I**UNIFORM FLOW IN OPEN CHANNEL:**

Types of channels –Types of flows - Velocity distribution – Energy and momentum correction factors – Chezy’s, and Manning’s formulae for uniform flow – Most Economical sections, Critical flow: Specific energy-critical depth – computation of critical depth

NON-UNIFORM FLOW IN OPEN CHANNELS: Steady Gradually Varied flow-Dynamic equation, Mild, Critical, Steep, horizontal and adverse slopes-surface profiles-direct step method- Rapidly varied flow, hydraulic jump, energy dissipation.

UNIT II

HYDRAULIC SIMILITUDE: Dimensional analysis-Rayleigh’s method and Buckingham’s pi theorem-study of Hydraulic models – Geometric, kinematic and dynamic similarities-dimensionless numbers – model and prototype relations.

UNIT III

BASICS OF TURBO MACHINERY: Hydrodynamic force of jets on stationary and moving flat, inclined and curved vanes, jet striking centrally and at tip, velocity triangles at inlet and outlet, expressions for work done and efficiency-Angular momentum principle.

UNIT IV

HYDRAULIC TURBINES – I: Layout of a typical Hydropower installation – Heads and efficiencies - classification of turbines. Pelton wheel - Francis turbine - Kaplan turbine - working, working proportions, velocity diagram, work done and efficiency, hydraulic design, draft tube – theory and efficiency. Governing of turbines-surge tanks-unit and specific quantities, selection of turbines, performance characteristics-geometric similarity-cavitation

UNIT V**PUMPS:**

CENTRAIFUGAL-PUMPS: Pump installation details-classification-work done-Manometric head-minimum starting speed-losses and efficiencies-specific speed, multistage pumps-pumps in parallel and series - performance of pumps-characteristic curves- NPSH- Cavitation.

RECIPROCATING PUMPS: Introduction, classification, components, working, discharge, indicator diagram, work done and slip.

TEXT BOOKS:

1. Open Channel flow, K. Subramanya, Tata McGraw Hill Publishers
2. Fluid mechanics and hydraulic machines, Rajput, A.K(2018) , S chand ,New Delhi
3. Fluid Mechanics, Modi and Seth, Standard book house.

REFERENCE BOOKS:

1. Fluid Flow in Pipes and Channels, G.L. Asawa, CBS
2. Fluid Mechanics and Machinery, C.S.P. OJHA, R. BERNDTSSON and P.N. Chandramouli, Oxford Higher Education.
3. Fluid Mechanics and Machinery, Md. Kaleem Khan, Oxford Highereducation.
4. Fluid mechanics and Hydraulic machines, R.K. Bansal, Laxmi publications ,New Delhi.

E-RESOURCES:

- <http://www.nptelvideos.in/2012/11/hydraulics.html>
- <http://www.nptelvideos.in/2012/11/advanced-hydraulics.html>
- <http://www.btechmaterials.com/download/hydraulics-hydraulic-machinery-hhm-material-notes/>

20A2201402-ENVIRONMENTAL ENGINEERING

Lecture – Tutorial:	2-1 Hours	Internal Marks:	30
Credits:	3	External Marks:	70

Prerequisites:**Course Objectives:**

- Outline planning and the design of water supply systems for a community/town/city and selection of source based on quality and quantity
- Design of water treatment plant for a village/city
- Impart knowledge on design of water distribution network
- Design of sewers and plumbing system for buildings
- Design of Sewage Treatment Plant

Course Outcomes:

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

C01	Select a source based on quality and quantity
C02	Estimate design population and water demand
C03	Design a water treatment plant for a village/city
C04	Design the water distribution network
C05	Design a sewer by estimating DWF and Storm water flow and plumbing system for buildings
C06	Design a Sewage Treatment Plant for a town/city.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 - Low, 2- Medium, 3 - High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
C01	2	-	-	-	-	-	-	1	-	-	-	-
C02	2	-	-	-	-	-	-	1	-	-	-	-
C03	2	-	-	-	-	-	-	1	-	-	-	-
C04	2	-	-	-	-	-	-	1	-	-	-	-
C05	2	2	3	-	-	-	-	1	-	-	-	-
C06	2	-	-	-	-	-	-	1	-	-	-	-

UNIT I

Introduction: Importance and Necessity of Protected Water Supply systems, Water borne diseases, Flow chart of public water supply system, Role of Environmental Engineer.

Water Demand and Quantity Estimation: Estimation of water demand for a town or city, Per capita Demand and factors influencing it - factors affecting water demand, Design Period, Population forecasting.

Sources of Water: Lakes, Rivers, Comparison of sources with reference to quality, quantity and other considerations- Ground water sources: springs, Wells and Infiltration galleries, Characteristics of water- Physical, Chemical and Biological characteristics and WHO guidelines for drinking water - IS 10500 2012 - Water quality standards for Agriculture, Industries and Construction.

UNIT II

Treatment of Water: Treatment methods: Theory and Design of Sedimentation, Coagulation, Filtration. **Disinfection:** Theory of disinfection-Chlorination and other Disinfection methods.

Removal of color and odors- Removal of Iron and Manganese - Adsorption-Fluoridation and defluoridation-Reverse Osmosis- Solar stills- Freezing

UNIT III

Collection and Conveyance of Water: Factors governing the selection of the intake structure, Conveyance of Water: Gravity and Pressure conduits, Types of Pipes, Pipe Materials, Pipe joints, Design aspects of pipe lines, Design of economical diameter of pumping main, HP of pump and monthly expenditure for an apartment and a village. Laying and testing of pipe lines- Capacity of storage reservoirs, Mass curve analysis.

Distribution of Water: Methods of Distribution system, Layouts of Distribution networks, Water main appurtenances - Sluice valves, Pressure relief valves, air valves, check valves, hydrants, and water meters-Ideal water supply system. Case studies.

UNIT IV

Sewerage: Estimation of sewage flow and storm water drainage – fluctuations – types of sewers -design of sewers.

Sewer appurtenances – cleaning and ventilation of sewers. **Sewage pumps.**

House Plumbing: Systems of plumbing-sanitary fittings and other accessories-one pipe and two pipe systems – Design of drainage in Gated communities, Apartments and Hotels.

Septic Tank - working Principles and Design

UNIT V

Sewage characteristics –Characteristics of sewage - BOD equations. ThOD, COD and BOD.

Treatment of Sewage: Primary treatment. **Secondary treatment:** Activated Sludge Process, principles, designs, and operational problems. Oxidation ponds, Trickling Filters – classification – design, operation and maintenance problems. RBCs. Fluidized bed reactors –Anaerobic digestion of sludge, Sludge Drying Beds.

Ultimate Disposal of sewage: Methods of disposal – disposal into water bodies-Oxygen Sag Curve- Disposal into sea, disposal on land, Crown corrosion, Sewage sickness. Effluent standards.

TEXT BOOKS:

1. Rural Municipal and Industrial water management, KVSG Murali Karishna, Environmental Protection Society, Kakinada, 2021.
2. Industrial Water and Wastewater Management, K.V.S.G. Murali Krishna, Paramount Publications, Visakhapatnam, 2018.
3. Elements of Environmental Engineering – K. N. Duggal, S. Chand & Company Ltd., New Delhi, 2012.

REFERENCE BOOKS:

1. Water Supply Engineering – P. N. Modi.
2. Water Supply Engineering – B. C. Punmia
3. Water Supply and Sanitary Engineering – G. S. Birdie and J. S. Birdie
4. Environmental Engineering, D. Srinivasan, PHI Learning Private Limited, New Delhi, 2011.
5. Environmental Engineering, Ruth F. Weiner and Robin Matthews – 4th Edition Elsevier, 2003
6. Environmental Engineering, D. Srinivasan, PHI Learning Private Limited, New Delhi, 2011.

E-RESOURCES:

- <https://www.alljntuworld.in/download/environmental-engineering-ee-materials-notes/>

20A2201403-ENGINEERING GEOLGOY Integrated (Theory & Lab)

Lecture – Practical:	2-2 Hours	Internal Marks:	30
Credits:	3	External Marks:	70

Prerequisites: Engineering Physics, Engineering Mechanics

Course Objectives:

1. To introduce the course: Engineering Geology to the Civil Engineering graduates.
2. To enable the students, understand what minerals and rocks are and their formation and identification.
3. To highlight significance/ importance/ role of Engineering Geology in construction of Civil Engineering structures.
4. To enable the student, realise its importance and applications of Engineering Geology in Civil Engineering constructions.

Course Outcomes:

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

CO1	Identify and classify the geological minerals
CO2	Measure the rock strengths of various rocks
CO3	Classify and measure the earthquake prone areas to practice the hazard zonation
CO4	Classify, monitor and measure the Landslides and subsidence
CO5	Prepares, analyses and interpret the Engineering Geologic maps
CO6	Investigate the project site for mega/mini civil engineering projects. Site selection for mega engineering projects like Dams, Tunnels, disposal sites etc.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	3	-	-	-	-	-	-	-	-	-	-	-
CO2	3	2	-	-	-	-	-	-	-	-	-	-
CO3	3	1	-	-	-	-	-	-	-	-	-	-
CO4	1	3	-	-	-	-	-	-	-	-	-	-
CO5	3	3	-	1	-	-	-	-	-	-	-	-
CO6	3	3	-	1	-	-	-	-	-	-	-	-

UNIT I

Basics of Geology: Branches of Geology, Importance of Geology in Civil Engineering with case studies.

Weathering: Weathering of rocks, Geological agents, weathering process of Rock, Rivers and geological work of rivers.

UNIT II

Mineralogy and Petrology: Definitions of mineral and rock-Different methods of study of mineral and rock. Physical properties of minerals and rocks for megascopic study for the following minerals and rocks. Common rock forming minerals: Feldspar, Quartz Group, Olivine, Augite, Hornblende, Mica Group, Asbestos, Talc, Chlorite, Kyanite, Garnet, Calcite and ore forming minerals are Pyrite, Hematite, Magnetite, Chlorite, Galena, Pyrolusite, Graphite, Chromite, Magnetite and Bauxite. Classification, structures, textures and forms of Igneous rocks, Sedimentary rocks, metamorphic rocks, and their megascopic study of granite varieties, (pink, gray, green). Pegmatite, Dolerite, Basalt

etc., Shale, Sand Stone, Lime Stone, Laterite, Quartzite, Gneiss, Schist, Marble, Khondalite and Slate

UNIT III

Structural Geology: Strike, Dip and Outcrop study of common geological structures associating with the rocks such as Folds, Faults, Joints and Unconformities- parts, types, mechanism and their importance in Civil Engineering.

UNIT IV

Ground Water: Water table, Cone of depression, Geological controls of Ground Water Movement, Ground Water Exploration Techniques. Earthquakes and Land Slides: Terminology, Classification, causes and effects, Shield areas and Seismic bells, Richter scale intensity, Precautions of building constructions in seismic areas. Classification of Landslides, Causes and Effects, measures to be taken prevent their occurrence at Landslides. **Geophysics:** Importance of Geophysical methods, Classification, Principles of Geophysical study by Gravity method, Magnetic method, Electrical methods, Seismic methods, Radiometric method and Electrical resistivity, Seismic refraction methods and Engineering properties of rocks.

UNIT V

Geology of Dams, Reservoirs and Tunnels: Types and purpose of Dams, Geological considerations in the selection of a Dam site. Geology consideration for successful constructions of reservoirs, Life of Reservoirs. Purpose of Tunneling, effects, Lining of Tunnels. Influence of Geology for successful Tunneling.

TEXT BOOKS:

1. 'Engineering Geology' by D. Venkat Reddy, Vikas Publishing House pvt. Ltd, 2013.
2. 'Engineering Geology' by N. Chennkesavulu, Trinity Press (Laxmi Publications), 2nd Edition, 2014.
3. 'Engineering Geology' by Vasudev Kanithi, University Press.

REFERENCE BOOKS:

1. 'Engineering Geology for Civil Engineers' by P.C. Varghese, PHI learning pvt. Ltd.
2. 'Geology for Engineers and Environmental Society' by Alan E Kehew, person publications, 3rd edition
3. 'Fundamentals of Engineering Geology' by P.G.Bell, B.S.P. Publications, 2012.
4. 'Engineering Geology' by V.Parthesarathi et al., Wiley Publications
5. 'Environmental Geology' by K.S.Valdiya, McGraw Hill Publications, 2nded.

E-RESOURCES:

- <https://www.alljntuworld.in/download/engineering-geology-eg-materials-notes/>
- <http://www.nptelvideos.in/2012/11/engineering-geology.html>

Practical	2 Hours		Internal Marks:	30								
Credits:			External Marks:	70								
Prerequisites:												
Course Objectives:												
➤ To identify the megascopic types of Ore minerals & Rock forming minerals.												
➤ To identify the Megascopic types of Igneous, Sedimentary, Metamorphic rocks.												
➤ To identify the topography of the site & material selection.												
Course Outcomes:												
Upon successful completion of the course, the student will be able to:												
C01	Identify Megascopic minerals & their properties.											
C02	Identify Megascopic rocks & their properties.											
C03	Identify the site parameters such as contour, slope & aspect for topography.											
C04	Know the occurrence of materials using the strike & dip problems											
Contribution of Course Outcomes towards achievement of Program Outcomes (1 - Low, 2- Medium, 3 - High)												
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
C01	2	3	-	1	1	-	-	-	-	-	-	2
C02	2	1	-	1	1	-	-	-	-	-	-	-
C03	2	3	-	2	1	-	-	-	-	-	-	2
List of Experiments												
<ol style="list-style-type: none"> 1. Physical properties of minerals: Mega-scopic identification of <ol style="list-style-type: none"> a. Rock forming minerals – Quartz group, Feldspar group, Garnet group, Mica group & Talc, Chlorite, Olivine, Kyanite, Asbestos, Tourmelene, Calcite, Gypsum, etc... b. Ore forming minerals – Magnetite, Hematite, Pyrite, Pyralusite, Graphite, Chromite, etc... 2. Megascopic description and identification of rocks. <ol style="list-style-type: none"> a) Igneous rocks – Types of Granite, Pegmatite, Gabbro, Dolerite, Syenite, Granite Porphery, Basalt, etc. b) Sedimentary rocks – Sand stone, Ferruginous sand stone, Lime stone, Shale, Laterite, Conglamorate, etc. c) Metamorphic rocks – Biotite – Granite Gneiss, Slate, Muscovite & Biotiteschist, Marble, Khondalite, etc. 3. Interpretation and drawing of sections for geological maps showing tilted beds, faults, Unconformities etc. 4. Simple Structural Geology problems. 5. Bore hole data. 6. Strength of the rock using laboratory tests. 7. Field work – To identify Minerals, Rocks, Geomorphology & Structural Geology 												

20A2201491-ENVIRONMENTAL ENGINEERING LAB

Labs / Instructions Hours/Week	3 Hours	Internal Marks:	30									
Credits:	1.5	External Marks:	70									
Prerequisites: Environmental Engineering												
Course Objectives:												
<ul style="list-style-type: none"> ➤ Estimation some important characteristics of water and wastewater in the laboratory ➤ It also gives the significance of the characteristics of the water and wastewater 												
Course Outcomes:												
Upon successful completion of the course, the student will be able to:												
CO1	Determine some important characteristics of water and wastewater in the laboratory											
CO2	Outline some conclusion and decide whether the water is potable or not.											
CO3	Decide whether the water body is polluted or not with reference to the state parameters in the list of experiments											
CO4	Determine strength of the sewage in terms of BOD and COD											
Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – High)												
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	3	3	-	-	-	3	-	2	3	-	-	3
CO2	3	3	-	-	-	3	-	2	3	-	-	3
CO3	3	3	-	-	-	3	-	2	3	-	-	3
CO4	3	3	-	-	-	3	-	2	3	-	-	3
List of Experiments												
<ol style="list-style-type: none"> 1. Determination of pH and Electrical Conductivity (Salinity) of Water and Soil. 2. Determination and estimation of Total Hardness–Calcium & Magnesium. 3. Determination of Alkalinity/Acidity 4. Determination of Chlorides in water and soil 5. Determination and Estimation of total solids, organic solids and inorganic solids and settleable solids by Imhoff Cone. 6. Determination of Iron. 7. Determination of Dissolved Oxygen with D.O. Meter & Wrinklers Method and B.O.D. 8. Determination of N, P, K values in solid waste 9. Physical parameters – Temperature, Colour, Odour, Turbidity, Taste. 10. Determination of C.O.D. 11. Determination of Optimum coagulant dose. 12. Determination of Chlorine demand. 13. Presumptive Coliform test. 												
TEXT BOOKS:												
1. Standard Methods for Analysis of Water and Waste Water – APHA Chemical Analysis of Water and Soil by KVSG Murali Krishna, Reem Publications, New Delhi												
REFERENCE BOOKS:												
1. Relevant IS Codes.												
2. Chemistry for Environmental Engineering by Sawyer and Mc. Carty.												
E-RESOURCES:												
vlab.co.in												

20A2201492-STRENGTH OF MATERIALS LAB

Labs / Instructions Hours/Week	3 Hours		Internal Marks:	30								
Credits:	1.5		External Marks:	70								
Prerequisites: Strength of materials												
Course Outcomes:												
Upon successful completion of the course, the student will be able to:												
CO1	Conduct tension test on steel											
CO2	Conduct compression tests on spring, wood, brick and concrete											
CO3	Conduct flexural and torsion test to determine elastic constants											
CO4	Determine hardness of metals											
Contribution of Course Outcomes towards achievement of Program Outcomes (1 - Low, 2- Medium, 3 - High)												
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	3	1	2	-	-	-	-	2	-	-	-	2
CO2	3	1	2	-	-	-	-	2	-	-	-	2
CO3	3	1	2	-	-	-	-	2	-	-	-	-
CO4	3	1	2	-	-	-	-	2	-	-	-	2
List of Experiments												
<ol style="list-style-type: none"> 1. Tension test on Mild steel bar 2. Bending test on (Steel / Wood) Cantilever beam. 3. Bending test on simply supported beam. 4. Torsion test 5. Hardness test 6. Spring test 7. Compression test on wood or concrete 8. Impact test (Charpy and Izod impact test) 9. Shear test (on UTM) 10. Verification of Maxwell's Reciprocal theorem on beams. 11. Use of Electrical resistance strain gauges 12. Continuous beam – deflection test. 												
TEXT BOOKS:												
<ol style="list-style-type: none"> 1. A Textbook of Strength of Materials, by R. K. Rajput, 7e (Mechanics of Solids) SI Units S.Chand & Co, New Delhi 2. Strength of materials by R. K. Bansal, Lakshmi Publications. 												
REFERENCE BOOKS:												
<ol style="list-style-type: none"> 1. Mechanics of Materials- by R. C.Hibbler, Pearson publishers 2. Mechanics of Solids – E P Popov, Prentice Hall. 3. Strength of Materials by B.S.Basavarajaiah and P. Mahadevappa, 3rd Edition, UniversitiesPress 4. Mechanics of Structures Vol – I by H.J.Shah and S.B.Junnarkar, Charotar Publishing HousePvt. Ltd. 												
E-RESOURCES:												
vlab.co.in												

20A2201493-FLUID MECHANICS & HYDRAULIC MACHINES LAB

Labs / Instructions Hours/Week	3 Hours		Internal Marks:	30								
Credits:	1.5		External Marks:	70								
Prerequisites: Environmental Engineering												
Course Objectives:												
<ul style="list-style-type: none"> ➤ To impart the experimental skills in flow measurement and real fluid flow problems ➤ To impart experimental skills to verify the performance characteristics of pumps and turbines 												
Course Outcomes:												
Upon successful completion of the course, the student will be able to:												
<ol style="list-style-type: none"> 1. Utilize the knowledge in the design of water supply pipe networks and measure the rate of flow in pipes and channels. 2. Design to turbines and able to identify suitable pumps and turbines for different working conditions 												
Contribution of Course Outcomes towards achievement of Program Outcomes (1 - Low, 2- Medium, 3 - High)												
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	3	3	-	-	-	3	-	2	3	-	-	3
CO2	3	3	-	-	-	3	-	2	3	-	-	3
List of Experiments												
<ol style="list-style-type: none"> 1. Calibration of Venturi meter & Orifice meter 2. Determination of Coefficient of discharge for a small orifice and mouth piece by a constant head and variable head method. 3. Calibration of contracted Rectangular Notch and /or Triangular Notch 4. Determination of Coefficient of loss of head in a sudden contraction and friction factor. 5. Verification of Bernoulli's equation. 6. Impact of jet on vanes 7. Study of Hydraulic jump. 8. Performance test on Pelton wheel turbine 9. Performance test on Francis turbine. 10. Efficiency test on centrifugal pump. 11. Efficiency test on reciprocating pump. 												
TEXT BOOKS:												
<ol style="list-style-type: none"> 1. Open Channel flow, K. Subramanya, Tata McGraw Hill Publishers 2. Fluid mechanics and hydraulic machines, Rajput, A.K(2018) , S chand ,New Delhi 3. Fluid Mechanics, Modi and Seth, Standard book house. 												
REFERENCE BOOKS:												
<ol style="list-style-type: none"> 1. Fluid Flow in Pipes and Channels, G.L. Asawa, CBS 2. Fluid Mechanics and Machinery, C.S.P. OJHA, R. BERNDTSSON and P.N. Chandramouli, Oxford Higher Education. 3. Fluid Mechanics and Machinery, Md. Kaleem Khan, Oxford Highereducation. 4. Fluid mechanics and Hydraulic machines, R.K. Bansal, Laxmi publications ,New Delhi. 												
E-RESOURCES:												
vlab.co.in												

20A2201991-FIELD STUDIES & AUDIT REPORTS

Labs / Instructions Hours/Week	3 Hours		15
Credits:	1.5	External Marks:	35
Prerequisites:			
Course Content			
Environmental Audit and compliance report OR Road safety audit with 1 or 2 KM length OR Water related leakage field studies			
Evaluation of Skill Oriented Course			
<p>Skill Oriented Course shall be evaluated for a total of 50 marks. Of 50 marks, 15marks shall be awarded by an internal committee consisting of two faculty members based on the presentation given and work carried out by a student and the remaining 35 marks are for final Viva-Voce examination conducted by the committee consisting of an External Examiner and the Head of the Department.</p>			



NRI INSTITUTE OF TECHNOLOGY

(An Autonomous Institution Permanently Affiliated to JNTUK, Kakinada)
(Accredited by NAAC with "A" Grade and ISO 9001:2015 Certified Institution)
POTHAVARAPPADU (V), (VIA) NUNNA, AGIRIPALLI (M), PIN - 521 212

DEPARTMENT OF CIVIL ENGINEERING

COURSE STRUCTURE FOR THIRD YEAR B.TECH PROGRAMME

III YEAR I SEMESTER

S.No	Course Code	Title of the Course	Scheme of Instruction (Periods Per Week)				Scheme of Examination (Maximum Marks)			No. of Credits
			L	T	P	Total	CIA	SEA	Total	
1	20A3101501	STRUCTURAL ANALYSIS	3	0	0	3	30	70	100	3
2	20A3101502	REINFORCED CONCRETE STRUCTURES	3	0	0	3	30	70	100	3
3	20A3101503	GEO-TECHNICAL ENGINEERING - I	3	0	0	3	30	70	100	3
4	20A3101511 20A3101512 20A3101513	OPEN ELECTIVE COURSE/JOB ORIENTED ELECTIVE (OE-1) STRENGTH OF MATERIALS FLUID MECHANICS SURVEYING AND GEOMATICS	3	0	0	3	30	70	100	3
5	20A3101521 20A3101522 20A3101523 20A3101524	PROFESSIONAL ELECTIVE COURSE - I CONSTRUCTION TECHNOLOGY AND MANAGEMENT REMOTE SENSING AND GIS ENVIRONMENTAL IMPACT ASSESEMENT RAILWAY ENGINEERING AND HARBOR ENGINEERING	3	0	0	3	30	70	100	3
6	20A3101591	PROFESSIONAL CORE COURSES LAB ADVANCED SURVEYING CAMP (FIELD WORK)	0	0	3	3	15	35	50	1.5
7	20A3101592	GEOTECHNICAL ENGINEERING LAB	0	0	3	3	15	35	50	1.5
8	20A3101593	SKILL ADVANCED COURSE: DESIGN OF SPECIAL STRUCTURES: CHIMNEY, INTZE TANKS, SPILL WAYS ETC.,	1	0	2	3	15	35	50	2
9	20A3100801	ESSENCE OF INDIAN TRADITIONAL KNOWLEDGE	2	0	0	2	30	70	100	0
10	20A3101594	SUMMER INTERNSHIP 2MONTHS (MANDATORY) AFTER SECOND YEAR (TO BE EVALUATED DURING V SEMESTER)								1.5
Total			18	0	8	26	225	525	750	21.5

III YEAR II SEMESTER

Sl. No	Course Code	Title of the Course	Scheme of Instruction (Periods Per Week)				Scheme of Examination (Maximum Marks)			No. of Credits
			L	T	P	Total	CIA	SEA	Total	
1	20A3201601	DESIGN AND DRAWING OF STEEL STRUCTURES	3	0	0	3	30	70	100	3
2	20A3201602	WATER RESOURCE ENGINEERING	3	0	0	3	30	70	100	3
3	20A3201603	GEOTECHNICAL ENGINEERING -2	3	0	0	3	30	70	100	3
4	20A3201611	PROFESSIONAL ELECTIVE COURSE -II	3	0	0	3	30	70	100	3
	20A3201612	ADVANCED STRUCTURAL ANALYSIS								
	20A3201613	ARCHITECTURE AND TOWN PLANNING								
	20A3201614	ROAD SAFETY ENGINEERING								
5	20A3201621	OPEN ELECTIVE COURSE/JOB ORIENTED ELECTIVE (OE-2)	3	0	0	3	30	70	100	3
	20A3201622	ELEMENTS OF CIVIL ENGINEERING								
	20A3201623	ENVIRONMENTAL ENGINEERING								
6	20A3101691	PROFESSIONAL CORE COURSES LAB ESTIMATION, COSTING AND CONTRACTS	0	0	3	3	15	35	50	1.5
7	20A3101691	PROFESSIONAL CORE COURSES LAB HIGHWAY DESIGN BY USING MX ROADS AND OPEN ROADS SOFTWARE	0	0	3	3	15	35	50	1.5
8	20A3101692	PROFESSIONAL CORE COURSES LAB CIVIL ENGINEERING PRACTICE : MANUAL DESIGNING OF A RESIDENTIAL BUILDING	1	0	2	3	15	35	50	1.5
9	20A3101693	SKILL ADVANCED COURSE/ SOFT SKILL COURSE: COMPUTATIONAL TOOLS	2	0	0	2	15	35	50	1.5
10	20A3201	EMPLOYABILITY SKILLS	2	0	0	2	30	70	100	0
11	20A3201	INDUSTRIAL/RESEARCH INTERNSHIP (MANDATORY) 2 MONTHS... TO BE EVALUATED IN IV YEAR I SEMESTER					30	70	100	1.5
Total			20	0	8	28				22.5

L - LECTURE T - TUTORIAL P - PRACTICAL
CIA - Continuous Internal Assessment SEA - Semester End Assessment

III - I

20A3101501 STRUCTURAL ANALYSIS

Lecture-Tutorial:	2-1Hours	Internal Marks:	30
Credits:	3	External Marks:	/U

Prerequisites: Engineering mechanics, Mathematics, Strength of Materials

Course Objectives:

1. To teach procedure for analysis of propped cantilever beams.
2. Familiarize Students about analysis of fixed beams.
3. To teach procedure for analysis of continuous beams by three moment area method.
4. Familiarize Students about analysis of continuous beams by slope deflection and moment distribution method.
5. To enable the student undergo analysis procedure of moving loads & their influence.

Course Outcomes:

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

CO1	Understand and Analyze indeterminate propped cantilever beams
CO2	Analyze fixed beams using compatibility method
CO3	Understand and Analyze continuous beams using Clapeyron's theorem of three moments Analysis
CO4	Analyze continuous beams using slope deflection equation
CO5	Understand and Analyze continuous beams using moment distribution method.
CO6	Identify the behavior of structures due to the expected loads, including the moving loads, acting on the structure. Estimate the bending moment and shear forces in Beams for different fixity conditions

Contribution of Course Outcomes towards achievement of Program Outcomes (1-Low, 2-Medium, 3-High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	2	-	-	-	-	-	-	-	-	-	-	2	-
CO2	3	-	-	-	-	-	-	1	-	-	-	-	1	-
CO3	3	-	-	-	-	-	-	1	-	-	-	-	3	-
CO4	3	-	-	-	-	-	-	1	-	-	-	-	3	-
CO5	3	-	-	-	-	-	-	1	-	-	-	-	2	-
CO6	2	2	-	-	-	-	-	1	-	-	-	-	3	-

UNIT I

PROPPED CANTILEVERS: Analysis of propped cantilevers-shear force and bending moment diagrams- Deflection of propped cantilevers.

FIXED BEAMS: Introduction to statically indeterminate beams with U. D. load, central point load, eccentric point load, number of point loads, uniformly varying load, couple and combination of loads - shear force and Bending moment diagrams-Deflection of fixed beams including effect of sinking of support.

UNITII

CONTINUOUS BEAMS: Introduction-Clapeyron's theorem of three moments
Analysis of continuous beams with moment of inertia with one or both ends fixed
continuous beams with overhang, continuous beams with different moment of
inertia for different spans-Effects of sinking of supports-shear force and bending
moment diagrams.

UNITIII

SLOPE-DEFLECTION METHOD: Introduction, derivation of slope
deflection equation, application to continuous beams with and without
settlement of supports-shear force and bending moment diagrams.

UNIT-IV

MOMENT DISTRIBUTION METHOD: Introduction to Moment distribution method,
Applications to continuous beams with and without settlement of supports-shear
force and bending moment diagrams.

UNITV

MOVING LOADS : Introduction maximum SF and BM at a given section and
absolute maximum S.F. and B.M due to single concentrated load, U. D load
longer than the span, U. D load shorter than the span, two point loads with fixed
distance between them and several point loads-Equivalent uniformly distributed
load-Focal length.

TEXTBOOKS:

1. Theory of Structures, Ramamurtham S., Dhanpat Rai Publishing
Company (p)Ltd, 2009.
2. Basic Structural Analysis, C.S.Reddy, Tata Mc Graw Hill.

REFERENCEBOOKS:

1. Theory of Structures, Timoshenko & Young, Tata McGraw Hill
2. Structural Mechanics Vol I & II, Junarkar S.B., Charotar Publishers
3. Intermediate Structural Analysis, C.K.Wang, McGraw Hill

E-REFERENCES :

- https://www.wipo.int/edocs/pubdocs/en/intproperty/450/wipo_pub_450.pdf
- <https://www.icsi.edu/media/webmodules/publications/9.4%20Intellectual%20Property%20Rights.pdf>
- <https://lecturenotes.in/notes/20883-note-for-intellectual-property-rights-ipr-by-gyan-prakash>

20A3101502 REINFORCED CONCRETE STRUCTURES

Lecture – Tutorial:	2-1 Hours	Internal Marks:	30
Credits:	3	External Marks:	70

Prerequisites: CONCRETE TECHNOLOGY, STRUCTURE ANALYSIS**Course Objectives:**

- To teach concepts of working stress and limit state methods.
- To impart design procedure of RC elements in flexure, shear and torsion.
- To teach design procedure for short and long RC columns.
- To demonstrate design of RC slab
- To explain design procedure of RC footings

Course Outcomes:**Upon successful completion of the course, the student will be able to:**

CO1	Understand the fundamental behavior of RCC structures and code provisions of IS 456:2000 and IS 875.
CO2	Analyze the different types of beams subjected to different loading conditions and understand the variation of moment of resistance (Understanding, Analyzing)
CO3	Apply the IS code provisions for design of sections and determining the reinforcement detailing satisfying the given loading conditions (Applying, Analyzing)
CO4	Design of slabs (one way slab, two way slab)
CO5	Design of columns and footings for given loading conditions (Designing)
CO6	Drawing the reinforcement detailing of beams, columns and footings and slabs for obtained data in design. (Analysing, drawing)

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O 1	PSO 2
CO1	3	2	3	-	-	2	-	2	-	-	-	-	3	1
CO2	3	3	3	-	-	2	-	2	-	-	-	-	3	1
CO3	3	3	3	-	-	2	-	2	-	-	-	-	3	1
CO4	3	3	3	-	-	2	-	2	-	-	-	-	3	1
CO5	3	3	3	-	-	2	-	2	-	-	-	-	3	1

UNIT I**INTRODUCTION TO DESIGN METHODS**

Working stress method: Introduction- loading standards – Dead, live, wind and earthquake loads, Elastic theory: design constants, modular ratio, neutral axis depth and moment of resistance for balanced, under-reinforced and over-reinforced sections. – Design for bending – analysis and design of singly reinforced and doubly reinforced beams

Limit state method: Concepts of limit state design – Characteristic loads – Characteristic strength – Partial load and safety factors – Assumptions in limit state design – stress - block parameters – limiting moment of Resistance.

UNIT II

DESIGN OF BEAMS

Beams: Design of singly and doubly reinforced beams-effective depth
Moment of Resistance- Minimum depth and minimum tension
reinforcement- Design examples of simply supported and cantilever beams.

Flanged sections: Analysis of singly and doubly reinforced flanged sections
– Design of flanged sections- effective width of flange- Minimum depth and
minimum tension reinforcement.

Shear and Torsion: Limit state design of section for Shear and torsion – Concept of
Anchorage and development length, Deflection- IS Code provisions.

UNIT III**DESIGN OF SLABS**

Slabs: Introduction to types of slabs- One way slab- two-way slabs- Design examples
for one way and two-way slabs – Continuous slab design – Different edge conditions
in slab - Reinforcement detailing.

UNIT IV**DESIGN OF COLUMNS**

Columns: Different types of columns – Design of short and long columns –
Columns subjected to axial load – Columns subjected to uni-axial and bi
axial bending – IS code provisions– Reinforcement detailing.

UNIT V**DESIGN OF FOOTINGS**

Footings: Different types of footings – Design of isolated footings – Square,
rectangular shape footings – Combined footing – Design of footings
subjected to axial load and uni axial moment – Reinforcement Detailing.

TEXT BOOKS:

- Design of Reinforced Concrete Structures, P.Dayaratnam, Oxford& IBH Pub.,
New Delhi.
- Reinforced Concrete-Limit State Design, A.K.Jain, Nem Chand & Bros.,
Roorkee.
- Reinforced Concrete, I.C.Syal & A,K,Goel, A.H, Wheeler & Co. Delhi.
- Reinforced Concrete Design, S.N.Sinha, TMH Pub., N.Delhi.

CODES OF PRACTICE:

- IS-456-2000
- SP-16(S&T)-1980, Design Aids for Reinforced Concrete to IS: 456, BIS, N.Delhi.
- SP-34(S&T)-1987 Handbook on Concrete Reinforcement and Detailing, BIS

E-RESOURCES:

- <https://www.alljntuworld.in/download/reinforced-concrete-structures-design-drawing-materials-notes/>
- <http://www.nptelvideos.in/2012/11/design-of-reinforced-concrete-structures.html>

20A3101503 GEO-TECHNICAL ENGINEERING I

Lecture – Tutorial:	2-1 Hours	Internal Marks:	30
Credits:	3	External Marks:	70

Prerequisites: NONE**Course Objectives:**

1. To enable the student to find out the index properties of the soil and classify it.
2. To enable the students to differentiate between compaction and consolidation of soils and to determine the consolidation settlement.
3. To enable the student to determine permeability of soils using various methods.
4. To impart the concept of seepage of water through soils and determine the seepage discharge.
5. To impart the concept of effective stress principal.

Course Outcomes:**Upon successful completion of the course, the student will be able to:**

CO1	Identify various soils based on their characteristics.
CO2	Characterize and classify soils based on different limits.
CO3	Evaluate permeability and seepage of soils.
CO4	Determine the permeability of soils and stratified soils
CO5	Determine plasticity characteristics of various soils
CO6	Design consolidation process by predicting settlement of soils.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 - Low, 2- Medium, 3 - High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	1	-	2	-	-	-	-	-	-	-	-	3	
CO2	3	-	-	-	-	-	-	1	-	-	-	-	3	
CO3	3	2	-	-	-	1	-	-	-	-	-	-	2	
CO4	2	2	-	-	-	1	-	-	-	-	-	-	3	
CO5	2	2	-	-	-	1	-	-	-	-	-	-	3	
CO6	2	2	2	-	-	1	-	1	-	-	-	-	3	

UNIT I**TYPES AND CHARACTERISTICS OF SOILS:**

Types of soils - formation and deposition - moisture content, unit weights, degree of saturation, voids ratio, porosity, specific gravity, mass specific gravity. Relationship between various soil parameters. Determination of Moisture content, Specific gravity and Unit weight using various methods.

PLASTICITY CHARACTERISTICS OF SOIL:

Consistency limits-liquid limit, plastic limit, shrinkage limit, plasticity, liquidity and consistency indices, flow & toughness indices. Determination of liquid limit, plastic limit and shrinkage limit. Soil classification based on particle size, texture, unified and Indian standard method.

UNIT II**PERMEABILITY OF SOIL:**

Darcy's law- coefficient of permeability: determination by constant-head and falling-head methods. Permeability of stratified soils - factors affecting - Seepage Analysis- stream and potential functions - flow nets, graphical method to plot flow nets.

UNIT III**EFFECTIVE STRESS PRINCIPLE:**

Introduction, effective stress principle, nature of effective stress, effect of water table. Capillary action, seepage pressure, quick sand condition. Compaction of Soil- theory of compaction- optimum moisture content- maximum dry density.

UNIT IV**STRESSES IN SOILS:**

Stresses in soils due to point load, line load, strip load, uniformly loaded circular, rectangular loaded area. Influence factors, Isobars, Boussinesq's equation, Newmark's Influence

UNIT V**CONSOLIDATION OF SOIL:**

Comparison between compaction and consolidation, initial, primary & secondary consolidation - Terzaghi's theory of consolidation, final settlement of soil deposits, computation of consolidation settlement and secondary consolidation.

TEXT BOOKS:

1. Soil Mechanics and Foundation Engg., K. R. Arora, Standard Publishers and Distributors, Delhi.
2. Geotechnical Engineering, C. Venkataramiah, New age International Pvt. Ltd, (2002).
3. Geotechnical Engineering, V.N.S.Murthy, BOOK World Enterprises, Mumbai.

REFERENCE BOOKS:

1. Soil Mechanics and Foundation, B. C. Punmia, Ashok Kumar Jain and Arun Kumar Jain, Laxmi publications Pvt. Ltd., New Delhi
2. Basic and Applied Soil Mechanics, Gopal Ranjan & A. S. R. Rao, New age International Pvt. Ltd, New Delhi.

E-REFERENCES:

- <http://www.btechmaterials.com/download/geotechnical-engineering-gte-material-notes/>
- <http://www.nptelvideos.in/2012/11/soil-mechanics.html>

PROFESSIONAL ELECTIVE-I
20A3101521 CONSTRUCTION TECHNOLOGY AND MANAGEMENT

Lecture – Tutorial:	2-1 Hours	Internal Marks:	30
Credits:	3	External Marks:	70

Prerequisites : NONE

Course Objectives:

- To introduce the concept of project management including network drawing and monitoring
- To introduce various equipments like moving equipment, trucks and handling equipment, aggregate production and construction equipment and machinery, related to construction.
- To gain the knowledge of different hoisting and earthwork equipment usage in the construction.
- To introduce the importance of safety in construction projects
- To gain knowledge in different construction methods

Course Outcomes:

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

CO1	Understand the basics of construction project management
CO2	appreciate the importance of construction planning
CO3	understand the functioning of various earth moving equipment
CO4	know the methods of production of aggregate and concreting and usage of machinery required for the works.
CO5	apply the gained knowledge to project management and construction techniques
CO6	To gain knowledge in various construction methods

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	2	1	2	1	1	3					2		2	
CO2	2	-	-	-	-	2							3	
CO3	3	-	-	-	-	3							2	3
CO4	1	2	2	3	3	1							3	3
CO5	2	-	-	-	-	2	3						2	3
CO6	3	-	-	-	-	3	1						2	3

UNIT I

CONSTRUCTION PROJECT MANAGEMENT AND ITS RELEVANCE:

Qualities of a project manager – project planning – coordination –scheduling – monitoring – bar charts – milestone charts – critical Path Method – Applications.

PROJECT EVALUATION AND REVIEW TECHNIQUE:

Cost analysis - updating – crashing for optimum cost – crashing for optimum resources – allocation of resources.

UNIT II

CONSTRUCTION EQUIPMENT:

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

UNIT III

HOISTING AND EARTHWORK EQUIPMENT:

Hoists – cranes – tractors - bulldozers – graders – scrapers- draglines - clamshell

buckets.

UNIT IV

CONCRETING EQUIPMENT:

Crushers – jaw crushers – gyratory crushers – impact crushers – selection of crushing equipment - screening of aggregate – concrete mixers – mixing and placing of concrete – consolidating and finishing.

UNIT V

CONSTRUCTION METHODS:

Earthwork – piling – placing of concrete – form work – fabrication and erection – quality control and safety engineering.

TEXT BOOKS:

- Construction Planning Equipment and Methods, Peurifoy and Schexnayder , Shapira, Tata Mcgraw hill
- Construction Project Management Theory and Practice, Kumar Neeraj Jha (2011), Pearson.
- Construction Technology, Subir K. Sarkar and Subhajit Saraswati, Oxford University press.
- Project Planning and Control with PERT and CPM, B. C. Punamia and K K Khandelwal, Laxmi Publications Pvt Ltd. Hyderabad.

REFERENCE BOOKS:

- Construction Project Management - An Integrated Approach, Peter Fewings, Taylor and Francis
- Construction Management Emerging Trends and Technologies, Trefor Williams, Cengage learning.
- Hand Book of Construction Management, P. K. Joy, Trinity Press Chennai, New Delhi.

E-REFERENCES:

20A3101522 REMOTE SENSING AND GIS

Lecture – Tutorial:	2-1 Hours	Internal Marks:	30
Credits:	3	External Marks:	70

Prerequisites : NONE**Course Objectives:**

- To introduce the basic principles of remote sensing and GIS techniques
- To learn various types of satellite sensors and platforms
- To learn concepts of visual and digital image analyses
- To understand the principles of spatial analysis
- To appreciate application of RS and GIS to civil engineering

Course Outcomes:**Upon successful completion of the course, the student will be able to:**

CO1	understand the basic principles of remote sensing and GIS techniques
CO2	learn various types of satellite sensors and platforms
CO3	learn concepts of visual and digital image analyses
CO4	Learn about GIS and preparation of raster data and vector data models
CO5	understand the principles of spatial data analysis
CO6	application of RS and GIS to civil engineering

Contribution of Course Outcomes towards achievement of Program Outcomes (1 - Low, 2- Medium, 3 - High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	1	2	2	3	3	1				1				2
CO2	1	2	2	3	3	1				1				3
CO3	1	2	2	3	3	1				1				3
CO4	1	2	2	3	3	1				1				3
CO5	1	2	2	3	3	1				1				3
CO6	1	2	2	3	3	1				1				3

UNIT I**INTRODUCTION TO REMOTE SENSING:**

Basic concepts of remote sensing, electromagnetic radiation, electromagnetic spectrum, interaction with atmosphere, energy interaction with the earth surfaces, Characteristics of remote sensing systems

SENSORS AND PLATFORMS:

Introduction, types of sensors, airborne remote sensing, space borne remote sensing, image data characteristics, digital image data formats-band interleaved by pixel, band interleaved by line, band sequential, IRS, LANDSAT, SPOT, MODIS, ASTER, RISAT and CARTOSAT.

UNIT II**IMAGE ANALYSIS:**

Introduction, elements of visual interpretations, digital image processing- image preprocessing, image enhancement, image classification, supervised classification, unsupervised classification.

UNIT III**GEOGRAPHIC INFORMATION SYSTEM:**

Introduction, key components, application areas of GIS, map projections. Data entry and preparation: spatial data input, raster data models, vector data models.

UNIT IV**SPATIAL DATA ANALYSIS:**

Introduction, overlay function-vector overlay operations, raster overlay operations, arithmetic operators, comparison and logical operators, conditional expressions, overlay using a decision table, network analysis-optimal path finding, network allocation, network tracing and buffer analysis.

UNIT V**RS AND GIS APPLICATIONS GENERAL:**

Land cover and land use, agriculture, forestry, geology, geomorphology, urban applications, Applications of Hydrology, Water resources and Disaster Management: Flood zoning and mapping, groundwater prospects and potential recharge zones, watershed management and disaster management with case studies.

TEXT BOOKS:

- Remote sensing and GIS, Bhatta B (2008) , Oxford University Press
- Remote Sensing and Image Interpretation, Lillesand, T.M, R.W. Kiefer and J.W. Chipman (2013), Wiley India Pvt. Ltd., New Delhi
- Fundamentals of Geographic Information Systems, Demers, M.N, Wiley India Pvt. Ltd, 2013.

REFERENCE BOOKS:

- Fundamentals of Remote Sensing, George Joseph, Universities Press, 2013.
- Concepts and Techniques of Geographical Information System, Chor Pang Lo and A K W Yeung, Prentice Hall (India), 2006
- Remote Sensing and its Applications, Narayan LRA, Universities Press, 2012.
- Introduction to Geographic Information Systems, KandTsung Chang, McGraw Hill Higher Education, 2009.
- Basics of Remote sensing & GIS, Kumar S, Laxmi Publications, New Delhi, 2005.
- Principals of Geographical Information Systems, Burrough P A and R.A. McDonnell, Oxford University Press, 1998.
- Remote Sensing, Schowenger, R. A (2006), Elsevier publishers.

E-REFERENCES:

1.

20A3101523 ENVIRONMENTAL IMPACT ASSESSMENT

Lecture – Tutorial:	2-1 Hours	Internal Marks:	30
Credits:	3	External Marks:	70

PREREQUISITES: ENVIRONMENTAL ENGINEERING, AIR POLLUTION AND CONTROL, SOLID AND HAZARDOUS WASTE MANAGEMENT

Course Objectives:

- To impart knowledge on different concepts of Environmental Impact Assessment.
- To know procedures of risk assessment.
- To learn the EIA methodologies and the criterion for selection of EIA methods.
- To know the procedures for environmental clearances and audit.
- To gain the knowledge of different environmental regulations of Government of India.

Course Outcomes:

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

CO1	Explain the role of stakeholder and public hearing in the preparation of EIA
CO2	Proficient in basics of EIA
CO3	Proficient in environmental related laws
CO4	Proficient in components and methods for prediction and assessment of impacts of air, water, etc.
CO5	Proficient in documentation and monitoring
CO6	Proficient in preparing EIA report for Projects like Irrigation and power generation

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	-	1	2	-	2	3	3					2	
CO2	3	-	1	2	-	2	3	3					2	
CO3		-	-	-	-	-	3	3					2	
CO4	2	-	1	-	-	2	3	3					2	
CO5	2	-	-	-	-	-	3	3					2	3
CO6							3	3					2	3

UNIT I**INTRODUCTION:**

Environmental Impact Assessment (EIA) – Objectives of EIA report – Contents of EIA – Environmental Impact Statement (EIS) – Environmental Risk Assessment (ERA) – Legal and regulatory aspects in India – Types and Limitations of EIA – Issues in EIA – National – Cross sectoral – social and cultural.

UNIT II**COMPONENTS AND METHODS:**

Components – Scoping – Screening. Identifying and evaluating alternatives. Mitigating measures dealing with uncertainty. Issuing environmental statement matrices – networks – checklists; Importance assessment techniques – cost benefit analysis – analysis of alternatives – methods for prediction and assessment of impact – Air – Water – Soil – Noise – Biological – Cultural – Social – Economic Environments, Standards and Guidelines for evaluation. Public participation in Environmental

decision-making.

UNIT III

DOCUMENTATION AND MONITORING:

Document planning – collection and organization of relevant information – use of visual display materials – team writing – remainder checklists. Environmental monitoring – Guidelines – policies – planning of monitoring programs. Environmental management plan. Post project audit. Expert system in EIA.

UNIT IV

CASE STUDIES:

Case studies of EIA of developmental projects. Dams, Sardar Sarovar Irrigation Project, Highway Projects, Power generation and their Impacts.

UNIT V

EIA notification by Ministry of Environment and Forest (Govt. of India):

Provisions in the EIA notification, procedure for environmental clearance, procedure for conducting environmental impact assessment report- evaluation of EIA report. Environmental legislation objectives, evaluation of Audit data and preparation of Audit report. Post Audit activities, Concept of ISO and ISO 14000. Case studies and preparation of Environmental Impact assessment statement for various Industries.

TEXT BOOKS:

- Environmental Impact Assessment, Canter Larry W., McGraw-Hill education Edi (1996)
- Environmental Impact Assessment Methodologies, Y. Anjaneyulu, B. S. Publication, Sultan Bazar, Hyderabad.
- Glasson, John, and Riki Therivel. Introduction to environmental impact assessment. Routledge, 2013.
- Eccleston, Charles H. Environmental impact assessment. John Wiley & Sons, New York, 2000.

REFERENCE BOOKS:

- Environmental Science and Engineering, J. Glynn and Gary W. Hein Ke – Prentice Hall Publishers
- Environmental Science and Engineering, Suresh K. Dhaneja, S. K. , Katania & Sons Publication., New Delhi.
- Environmental Pollution and Control, H. S. Bhatia, Galgotia Publication (P) Ltd, Delhi

E-REFERENCES:

1.

20A3101524 RAILWAY ENGINEERING AND HARBOR ENGINEERING

Lecture – Tutorial:	2-1 Hours	Internal Marks:	30
Credits:	3	External Marks:	70

Prerequisites: SURVEYING AND GEO-METRICS, HIGHWAY ENGINEERING**Course Objectives:**

- To know various components and their functions in a railway track
- To acquire design principles of geometrics in a railway track
- To know various techniques for the effective movement of trains.
- To know the planning, construction and maintenance of Docks
- To know the planning, construction and maintenance of Harbors.

Course Outcomes:**Upon successful completion of the course, the student will be able to:**

CO1	To know various components and their functions in a railway track
CO2	To acquire design principles of geometrics in a railway track
CO3	To know various techniques for the effective movement of trains by installing turnouts.
CO4	To know various techniques for the effective movement of trains using controls.
CO5	To know the planning, construction and maintenance of Docks
CO6	To know the planning, construction and maintenance of Harbors.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3					2		3					2	
CO2	3	3				2		3	2			3	3	
CO3	3					2		3	3				2	
CO4	3					2		3	3			1	3	
CO5	3					2		3	3			3	3	
CO6	3					2		3	3			3	3	

UNIT I**COMPONENTS OF RAILWAY ENGINEERING**

Permanent way components – Railway Track Gauge - Cross Section of Permanent Way - Functions of various Components like Rails, Sleepers and Ballast –Rail Fastenings – Creep of Rails- Theories related to creep – Adzing of Sleepers- Sleeper density – Rail joints.

UNIT II**GEOMETRIC DESIGN OF RAILWAY TRACK**

Alignment – Engineering Surveys - Gradients- Grade Compensation- Cant and Negative Super elevation- Cant Deficiency – Degree of Curve – safe speed on curves – Transition curve – Compound curves – Reverse curves – Extra clearance on curves – widening of gauge on curves – vertical curves – cheek rails on curves.

UNIT III**TURNOUTS & CONTROLLERS**

Track layouts – Switches – Design of Tongue Rails – Crossings – Turnouts – Layout of Turnout – Double Turnout – Diamond crossing – Scissors crossing. Signal Objectives – Classification – Fixed signals – Stop signals – Signaling systems – Mechanical signaling system – Electrical signaling system – System for Controlling

Train Movement – Interlocking – Modern signaling Installations.

UNIT IV

PLANNING, LAYOUT, CONSTRUCTION & MAINTENANCE OF DOCKS

History of Port Growth – Factors affecting Growth of Port. Classification of Harbours – Planning of A Port – Ship Characteristics as they Relate to Port Planning- Hydrographic and Oceanographic Data Required for Port Design –Classification of ports – Requirement of a good port – classification of Harbors – Docks - Dry & wet docks

UNIT V

PLANNING, LAYOUT, CONSTRUCTION & MAINTENANCE OF HARBORS

Transition sheds and workhouses – Layouts; Quays – construction of Quay walls – Wharves – Jetties – Tides - Tidal data and Analysis – Break waters – Dredging – Maintenance of Ports and Harbors – Navigational aids. Determination of Best Location of a Harbor to Afford Maximum Protection- Minimum Maintenance and Facilities for Expansion.

TEXT BOOKS:

- Railway Engineering, Saxena & Arora – Dhanpat Rai, New Delhi.
- Docks and Harbor Engineering, Bindra S.P. – Dhanpathi Rai & Sons, New Delhi.

REFERENCE BOOKS:

- Transportation Engineering, Railways, Airports, Docks & Harbours, Srinivasa Kumar R, University Press, Hyderabad.
- Highway, Railway, Airport and Harbor Engineering, Subramanian K. P, Scitech Publications (India) Pvt Limited, Chennai.
- Railway Engineering, Satish Chandra and Agarwal M. M., Oxford University Press, New Delhi.

E-REFERENCES:

20A3101591 SURVEYING FIELD WORK - II

Practical	3 Hours	Internal Marks:	40
Credits:	1.5	External Marks:	60

Prerequisites: SURVEYING & GEOMATICS, SURVEYING FIELD WORK -I

Course Outcomes:

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

CO1 Able to apply the knowledge of Theodolite in different operations in civil engineering projects.

CO2 Able to use total station in the field of civil engineering land survey.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 - Low, 2- Medium, 3 - High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	2	-	-	-	3	-	-	-	2	2	-	3	3	3
CO2	2	-	-	-	3	-	-	-	2	2	-	3	3	3

List of Experiments

PART-A

EXPERIMENTS ON THEODOLITE

1. Theodolite Survey: Determining the Horizontal and Vertical Angles by the method of repetition method.
2. Theodolite Survey: Finding the distance between two inaccessible points.
3. Theodolite Survey: Finding the height of far object.
4. Theodolite Survey: Determining the Horizontal and Vertical Angles by the method of reiteration method.
5. Tachometric survey: Heights and distance problems using Tachometric principles.
6. One Exercise on Curve setting.

PART - B

EXPERIMENTS ON TOTAL STATION

7. Total Station: Introduction to total station and practicing setting up, levelling up and elimination of parallax error.
8. Total Station: Determination of area using total station.
9. Total Station: Determination of Remote height.
10. Total Station: distance between two inaccessible points.

20A3101592 GEO-TECHNICAL ENGINEERING LAB

Practical	3 Hours	Internal Marks:	30
Credits:	1.5	External Marks:	70

Prerequisites: NONE**Course Objectives:**

- To impart knowledge of determination of index properties (LL,PL&SL)
- To teach how to classify classification of soils.
- To teach how to determine compaction characteristics and consolidation behavior from relevant lab tests.
- Determine permeability of soils.
- To teach how to determine shear parameters of soil through different laboratory tests.

Course Outcomes:**Upon successful completion of the course, the student will be able to:**

CO1 Determine index properties of soil and classify them.

CO2 Determine permeability of soils.

CO3 Determine Compaction characteristics.

CO4 Determine Consolidation characteristics.

CO5 Determine shear strength characteristics.

CO6 Determine field density.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 - Low, 2- Medium, 3 - High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	3	-	3	-	2	-	2	-	-	-	-	1	2
CO2	3	3	-	3	-	2	-	2	-	-	-	-	1	2
CO3	3	3	-	3	-	2	-	2	-	-	-	-	1	2
CO4	3	3		3		2		2					1	2
CO5	3	3		3		2		2					1	2
CO6	3	3		3		2		2					1	3

List of Experiments

1. To determine Specific gravity of given soil sample.
2. To determine Atterberg's Limits.(LL,PL,&SL).
3. To determine Field density-Core cutter and Sand replacement methods.
4. To classify Grain size analysis by sieving.
5. To classify Grain size analysis by Hydrometer Analysis Test.
6. To determine Permeability of soil - Constant and Variable head tests.
7. To determine water content and dry density by Compaction test.
8. To determine Consolidation test (to be demonstrated).
9. To determine strength parameters by using Direct Shear test.
10. To determine strength parameters by using Triaxial Compression test (UU Test).
11. To determine strength parameters by using Unconfined Compression test.
12. To determine strength parameters by using Vane Shear test.
13. To determine Differential free swell (DFS).
14. To determine CBR Test.

TEXT BOOKS:

1. Soil Mechanics and Foundation Engg., K. R. Arora, Standard Publishers and Distributors, Delhi.
2. Geotechnical Engineering, C. Venkataramiah, New age International Pvt Ltd, (2002).

REFERENCE BOOKS:

1. 'Determination of Soil Properties' by J. E. Bowles.
2. IS Code 2720 – relevant parts.

20A3101593 SKILL ADVANCED COURSE

Practical	2 Hours	Internal Marks:	30
Credits:	2	External Marks:	70

DESIGN OF SPECIAL STRUCTURES

- CHIMNEY,
- HINGE TANKS,
- SPILL WAYS.

20A3100801 ESSENCE OF INDIAN KNOWLEDGE AND TRADITIONS

Lecture – Tutorial:	2-0 Hours	Internal Marks:	30
Credits:	0	External Marks:	70

Prerequisites: NONE**Course Objectives:**

1. To develop knowledge of fundamental management concepts, skills and tools, to aid in problem solving and decision making.
2. To develop and understanding about the organizational structure and relationship between authority and responsibility in various structures.
3. To discuss the evolution of principles that make it possible to design facilities, processes, and control systems with a degree of predictability as to their performance.
4. To develop comprehensive skills in planning, selecting, motivating, and developing the human references for organizational effectiveness.
5. To understand the broad scope of marketing, societal, ethical and other diverse aspects of marketing.

Course Outcomes:**Upon successful completion of the course, the student will be able to:**

CO1	Understand the concept of Traditional knowledge and its importance
CO2	Know the need and importance of protecting traditional knowledge
CO3	Know the various enactments related to the protection of traditional knowledge
CO4	Understand the concepts of Intellectual property to protect the traditional knowledge
CO5	Develop comprehensive skills in planning, selecting, motivating, and developing the human references for organizational effectiveness.
CO6	Understand the broad scope of marketing, societal, ethical and other diverse aspects of marketing

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	2	-	-	-	-	-	-	2		-	-	-	-	-
CO2	2	-	-	-	-	-	-	2		-	-	-	-	-
CO3	2	-	-	-	-	-	-	2		-	-	-	-	-
CO4	2	-	-	-	-	-	-	2		-	-	-	-	-
CO5	2	-	-	-	-	-	-	2		-	-	-	-	-
CO6	2	-	-	-	-	-	-	2		-	-	-	-	-

UNIT I**INTRODUCTION TO TRADITIONAL KNOWLEDGE:**

Define traditional knowledge, nature and characteristics, scope and importance, kinds of traditional knowledge, the physical and social contexts in which traditional knowledge develop, the historical impact of social change on traditional knowledge systems. Indigenous Knowledge (IK), characteristics, traditional knowledge vis-à-vis indigenous knowledge, traditional knowledge Vs western knowledge traditional knowledge vis-à-vis formal knowledge.

UNIT II**PROTECTION OF TRADITIONAL KNOWLEDGE:**

The need for protecting traditional knowledge Significance of TK Protection, value of TK in global economy, Role of Government to harness TK.

LEGAL FRAMEWORK AND TK: A:

The Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006, Plant Varieties Protection and Farmers Rights Act,2001 (PPVFR Act);B: The Biological Diversity Act 2002 and Rules 2004, the protection of traditional knowledge bill, 2016. Geographical indications act 2003.

UNIT III**TRADITIONAL KNOWLEDGE AND INTELLECTUAL PROPERTY:**

Systems of traditional knowledge protection, Legal concepts for the protection of traditional knowledge, Certain non IPR mechanisms of traditional knowledge protection, Patents and traditional knowledge, Strategies to increase protection of traditional knowledge, global legal FORA for increasing protection of Indian Traditional Knowledge.

UNIT IV**TRADITIONAL KNOWLEDGE IN DIFFERENT SECTORS:**

Traditional knowledge and engineering, Traditional medicine system, TK and biotechnology, TK in agriculture, Traditional societies depend on it for their food and healthcare needs

UNIT-V

Importance of conservation and sustainable development of environment, Management of biodiversity, Food security of the country and protection of TK.

TEXT BOOKS:

1. Kapil Kapoor, "Text and Interpretation: The India Tradition", ISBN: 81246033375,2005.
2. "Science in Samskrit", Samskrita Bharti Publisher,ISBN-13:978-8187276333,2007.
3. NCERT, "Position paper on Arts, Music, Dance and Theatre", ISBN 81-7450-494-X,2006.

REFERENCE BOOKS:

1. Traditional Knowledge System in India by Amit Jha Atlantic publishers, 2002
2. "Knowledge Traditions and Practices of India" Kapil Kapoor, Michel Danino.

E- RESOURCES:

- https://www.youtube.com/watch?v=sSgj_GZowU8

III-II

20A3201601 DESIGN OF STEEL STRUCTURES

Lecture – Tutorial:	2-1 Hours	Internal Marks:	30
Credits:	3	External Marks:	70

Prerequisites: REINFORCED CONCRETE STRUCTURES, STRENGTH OF MATERIALS

Course Objectives:

1. Familiarize Students with different types of Connections and relevant IS codes.
2. Equip student with concepts of design of flexural members.
3. Understand Design Concepts of tension and compression members in trusses.
4. Familiarize students with different types of Columns and column bases and their Design.
5. Familiarize students with Plate girder and its Design.
6. Familiarize students with Gantry Girder and its Design.

Course Outcomes:

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

CO1	Explain different types of Connections and relevant IS code provision.
CO2	Design beams and columns.
CO3	Design of truss elements.
CO4	Design of column bases.
CO5	Design Plate Girders with curtailment of flanges.
CO6	Design principles of Gantry Girders with curtailment of flanges.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	2	3	-	-	-	-	3	-	-	-	2	1	2
CO2	3	3	3	-	-	-	-	3	-	-	-	2	1	2
CO3	3	3	3	-	-	-	-	3	-	-	-	2	1	2
CO4	3	3	3	-	-	-	-	3	-	-	-	2	1	2
CO5	3	3	3	-	-	-	-	3	-	-	-	3	1	3
CO6	3	3	3	-	-	-	-	2	-	-	-	3	1	3

UNIT I

CONNECTIONS:

Riveted connections – Rivet value, Welded connections: Advantages and disadvantages of welding- Strength of welds-Butt and fillet welds: Permissible stresses – IS Code requirements. Design of fillet weld subjected to in plane and out of plane.

BEAMS:

Allowable stresses, design of simple beams-Curtailment of flange plates - IS Code-provision - Beam - to - beam connection, shear, buckling, check for deflection and bearing, laterally unsupported beams.

UNIT II

TENSION MEMBERS AND COMPRESSION MEMBERS:

Design of members in direct tension and bending –effective length of columns. Slenderness ratio – permissible stresses. Design of compression members. Roof

Trusses: types of trusses – Design loads – Load combinations as per IS Code, detailing – Design of simple roof trusses elements (purlins, members and joints).

UNIT III

DESIGN OF BUILT-UP COLUMNS:

Built-up columns with lacing and/or battening system. Design of Eccentrically loaded columns, Splicing of columns.

DESIGN OF COLUMN BASES:

Slab base and gusseted base under axial load and moment.

UNIT IV

PLATE GIRDERS:

Design of plate girder – IS code Provisions – Welded – Curtailment of flange plates, stiffeners – splicing and connections.

UNIT V

GANTRY GIRDER:

Design of Gantry Girder - impact factors – longitudinal forces

FINAL EXAMINATION PATTERN:

The end examination paper should consist of Part A and Part B. part A consist of two Questions in Design and Drawing out of which one question is to be answered. Part B should consist of five questions and design out of which three are to be answered. Weightage for Part – A is 40% and Part- B is 60%.

TEXT BOOKS:

1. Steel Structures Design and Practice, N. Subramanian, Oxford University Press.
2. Design of steel structures, S. K. Duggal, Tata Mc Graw Hill, New Delhi.

REFERENCE BOOKS:

1. Structural Design in Steel, SarwarAlamRaz, New Age International Publishers, New Delhi.
2. Design of Steel Structures, M. Raghupathi, Tata Mc. Graw-Hill.
3. Structural Design and Drawing, N. Krishna Raju; University Press.
4. Indian Standard Code for General Construction in Steel, 3rd revision, Indian Standards Institution, New Delhi, 2008.
5. IS – 875, Code of practice for design loads (other than earth quake) for buildings and structures (Part-1-Part 5), Bureau of Indian standards.
6. Steel Tables.

E-REFERENCES:

- <https://www.alljntuworld.in/download/steel-structures-design-drawing-dss-materials-notes/>
- <http://www.nptelvideos.in/2012/11/design-of-steel-structures.html>

20A3201602 WATER REFERENCES ENGINEERING

Lecture – Tutorial:	2-1 Hours	Internal Marks:	30
Credits:	3	External Marks:	70

Prerequisites: HYDRAULICS**Course Objectives:**

- Introduce hydrologic cycle and its relevance to Civil engineering.
- Make the students understand physical processes in hydrology and, components of the hydrologic cycle.
- Appreciate concepts and theory of physical processes and interactions.
- Learn measurement and estimation of the components hydrologic cycle.
- Provide an overview and understanding of Unit Hydrograph theory and its analysis.
- Understand flood frequency analysis, design flood, flood routing.
- Appreciate the concepts of groundwater movement and well hydraulics.

Course Outcomes:**Upon successful completion of the course, the student will be able to:**

CO1	Develop design storms and carry out frequency analysis.
CO2	Determine storage capacity and life of reservoirs.
CO3	Develop unit hydrograph and synthetic hydrograph.
CO4	Estimate flood magnitude and carry out flood routing.
CO5	Determine aquifer parameters and yield of wells.
CO6	Model hydrologic processes.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	2	2	3	-	-	1	-	1	-	-	-	-	1	2
CO2	2	2	-	-	-	-	-	-	-	-	-	-	1	2
CO3	3	2	2	-	-	1	-	1	-	-	-	-	1	2
CO4	2	2	-	-	-	-	-	-	-	-	-	-	1	2
CO5	2	2	-	-	-	-	-	-	-	-	-	-	1	2
CO6	2	1	-	-	-	-	-	-	-	-	-	-	1	2

UNIT I**ENGINEERING HYDROLOGY AND PRECIPITATION:**

Engineering hydrology and its applications, Hydrologic cycle, hydrological data-sources of data.

PRECIPITATION:

Types and forms, measurement, rain gauge network, presentation of rainfall data, average rainfall, continuity and consistency of rainfall data, frequency of rainfall, Intensity-Duration-Frequency (IDF) curves, Depth-Area-Duration (DAD) curves, Probable Maximum Precipitation (PMP), design storm.

UNIT II**ABSTRACTIONS FROM PRECIPITATION:**

Initial abstractions. Evaporation: factors affecting, measurement, reduction
 Evapotranspiration: factors affecting, measurement, control - Infiltration: factors affecting, Infiltration capacity curve, measurement, infiltration indices.

UNIT III**RUNOFF AND HYDROGRAPH ANALYSIS:**

Catchment characteristics, Factors affecting runoff, components, computation-empirical formulae, tables and curves, stream gauging, rating curve, flow mass curve and flow duration curve. Components of hydrograph, separation of base flow, effective rainfall hyetograph and direct runoff hydrograph, unit hydrograph, assumptions, derivation of unit hydrograph, unit hydrographs of different durations, principle of superposition and S-hydrograph methods, limitations and applications of unit hydrograph, synthetic unit hydrograph.

UNIT IV**FLOODS:**

Causes and effects, frequency analysis- Gumbel's and Log-Pearson type III distribution methods, Standard Project Flood (SPF) and Probable Maximum Flood (MPF), flood control methods and management.

FLOOD ROUTING:

Hydrologic routing, channel and reservoir routing-Muskingum and Puls methods of routing.

UNIT V**IRRIGATION:**

Necessity and importance, principal crops and crop seasons, types, methods of application, soil-water-plant relationship, soil moisture constants, consumptive use, estimation of consumptive use, crop water requirement, duty and delta, factors affecting duty, depth and frequency of irrigation, irrigation efficiencies, water logging and drainage, standards of quality for irrigation water, crop rotation.

TEXT BOOKS:

1. Engineering Hydrology, Jayarami Reddy, P., Laxmi Publications Pvt. Ltd., (2013), New Delhi
2. Irrigation and Water Power Engineering, B. C. Punmia, Pande B. B. Lal, Ashok Kumar Jain and Arun Kumar Jain, Lakshmi Publications (P) Ltd.

REFERENCE BOOKS:

1. Engineering Hydrology Subramanya, K, Tata McGraw-Hill Education Pvt Ltd (2013), New Delhi.
2. Irrigation Engineering and Hydraulic Structure, Santosh Kumar Garg, Khanna Publishers.

E-REFERENCES:

- <http://www.nptelvideos.in/2012/11/water-REFERENCES-systemsmodeling.html>
- <http://www.nptelvideos.in/2012/11/advanced-hydrology.html>
- <http://freevideolectures.com/Course/100/Water-REFERENCES-Engineering>
- <http://www.btechmaterials.com/download/water-REFERENCES-engineering-materials-notes/>
- <http://www.btechmaterials.com/download/water-REFERENCES-engineering-ii-materials-notes/>

20A3201603 GEOTECHNICAL ENGINEERING-II

Lecture – Tutorial:	2-1 Hours	Internal Marks:	30
Credits:	3	External Marks:	70

Prerequisites: GEOTECHNICAL ENGINEERING-I**Course Objectives:**

- 1) To impart knowledge on soil exploration.
- 2) To teach slope stability and safety assessment of earth retaining structures.
- 3) To impart knowledge on bearing capacity and settlement of shallow foundations.
- 4) To impart knowledge on bearing capacity and settlement of pile foundations.
- 5) To throw light on well foundation designs.

Course Outcomes:**Upon successful completion of the course, the student will be able to:**

CO1	Understand the methods of soil exploration.
CO2	Compile soil investigation report
CO3	Assess stability of slopes and earth retaining structures
CO4	Determine safe bearing capacity and settlement of shallow foundations.
CO5	Design pile foundations.
CO6	Design well foundations.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	2	-	-	-	-	-	-	-	-	-	-	-	1	2
CO2	2	2	-	-	-	2	-	-	-	-	-	-	1	2
CO3	2	2	-	-	-	-	-	-	-	-	-	-	1	2
CO4	2	2	3	-	-	2	-	1	-	-	-	-	1	2
CO5	2	3	3	-	-	2	-	1	-	-	-	-	1	2
CO6	2	3	3	-	-	2	-	1	-	-	-	-	1	2

UNIT I**SOIL EXPLORATION:**

Methods of soil exploration – Boring and Sampling methods – Penetration Tests – Pressure meter – Observation of ground water-Geophysical Methods-Programme planning and preparation of soil investigation report.

UNIT II**EARTH RETAINING STRUCTURES:**

Infinite and finite earth slopes in sand and clay – types of failures – factor of safety of infinite slopes – stability analysis by Swedish arc method, standard method of slices – Taylor's Stability Number-Stability of slopes of dams and embankments - different conditions. Rankine's & Coulomb's theory of earth pressure – Culmann's graphical method - earth pressures in layered soils.

UNIT III**SHALLOW FOUNDATIONS:**

Types of foundations and influencing factors - Bearing capacity – determination of bearing capacity – factors influencing bearing capacity – analytical methods to determine bearing capacity – Terzaghi's theory – settlements – Design aspects of

shallow foundations-IS Methods.

UNIT IV

PILE FOUNDATIONS:

Types of piles – Load carrying capacity based on static and Dynamic formulae– Pile load tests - pile groups in sands and clays- pile cap design.

UNIT V

WELL FOUNDATIONS:

Types – Different shapes – Components of well foundation – forces acting on well foundations - Design Criteria – Determination of staining thickness and plug - construction and Sinking of wells – Tilt and shift.

TEXT BOOKS:

1. C. Venkataramiah, Geotechnical Engineering, New age International Pvt . Ltd, (2002).
2. B. C. Punmia, Ashok Kumar Jain and Arun Kumar Jain, Soil Mechanics and Foundation by, Laxmi, publications Pvt. Ltd., New Delhi.

REFERENCE BOOKS:

1. T. N. Ramamurthy, a textbook of geotechnical engineering (soil mechanics), s. Chand and company limited, new delhi.
2. Purushtoma raj, soil mechanics and foundation engineering, pearson publications.

E-REFERENCES:

- <http://www.nptelvideos.in/2012/11/foundation-engineering.html>
- <http://www.btechmaterials.com/download/foundation-engineering-fe-material-notes/>

20A3201611 ADVANCED STRUCTURAL ANALYSIS

Lecture – Tutorial:	2-1 Hours	Internal Marks:	30
Credits:	3	External Marks:	70

Prerequisites: STRENGTH OF MATERIALS, STRUCTURAL ANALYSIS**Course Objectives:**

- Familiarize Students with Different types of Structures.
- Equip student with concepts of Arches.
- Understand Analysis methods, Slope Deflection Method, Moment Distribution and Kanis Method.
- Understand Concepts of lateral Load analysis.
- Understand Analysis Methods Flexibility Matrix Method and Stiffness Matrix Method.

Course Outcomes:**Upon successful completion of the course, the student will be able to:**

C01 Analyze three Hinged Arches and two Hinged Arches.

C02 Analyze structures using Slope deflection method.

C03 Analyze structures using Moment Distribution method.

C04 Analyze structures using Kani's Methods.

C05 Carryout lateral Load analysis of structures.

C06 Analyze structures using Matrix methods.

**Contribution of Course Outcomes towards achievement of Program Outcomes
(1 - Low, 2- Medium, 3 - High)**

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
C01	3	2	1	-	-	-	-	-	-	1	1	-	2	3
C02	3	2	1	-	-	-	-	-	-	1	1	-	2	3
C03	3	2	1	-	-	-	-	-	-	1	1	-	2	3
C04	3	2	1	-	-	-	-	-	-	1	1	-	2	3
C05	3	2	1	-	-	-	-	-	-	1	1	-	2	3
C06	3	2	1	-	-	-	-	-	-	1	1	-	2	3

UNIT I**THREE HINGED ARCHES:**

Elastic theory of arches – Eddy's theorem – Determination of horizontal thrust, bending moment, normal thrust and radial shear – effect of temperature. Hinges with supports at different levels.

TWO HINGED ARCHES:

Determination of horizontal thrust, bending moment, normal thrust and radial shear – Rib shortening and temperature stresses, Tied arches – Fixed arches – (No analytical question).

UNIT II**SLOPE-DEFLECTION:**

Analysis of single bay, single storey, portal frame including side sway.

UNIT-III**MOMENT DISTRIBUTION METHOD:**

Analysis of single bay, single storey, portal frame including side sway.

KANI'S METHOD:

Analysis of continuous beams – including settlement of supports and single bay

portal frames with and without side sway.

UNIT IV

LATERAL LOAD ANALYSIS USING APPROXIMATE METHODS:

Application to building frames.

(i) Portal Method (ii) Cantilever Method.

UNIT V

MATRIX METHOD:

Flexibility methods: Introduction, application to continuous beams (maximum of two unknowns) including support settlements.

STIFFNESS METHOD:

Introduction, application to continuous beams (maximum of two unknowns) including support settlements.

TEXT BOOKS:

1. Structural Analysis, T. S. Thandavamoorthy, Oxford university press, India.
2. Structural Analysis, R.C. Hibbeler, Pearson Education, India
3. Theory of Structures – II, B. C. Punmia, Jain & Jain, Laxmi Publications, India.
4. Structural Analysis, C.S. Reddy, Tata Mc-Graw hill, New Delhi.

REFERENCE BOOKS:

1. Intermediate Structural Analysis, C. K. Wang, Tata McGraw Hill, India.
2. Theory of structures, Ramamuratham, Dhanpatrai Publications.
3. Analysis of structures, Vazrani & Ratwani – Khanna Publications.
4. Comprehensive Structural Analysis-Vol. I & 2, R. Vaidyanathan & P. Perumal-Laxmi Publications Pvt. Ltd., New Delhi.
5. Structural Analysis I, P.N. Chandramouli. Yesdee Publishing Pvt Limited.
6. Structural Analysis, Aslam Kassimali, Cengage Learning.
7. Matrix Methods of Structural Analysis, P.N. Godbole, R. S.. Sonaparote, PHI Learning Pvt Limited.

E-REFERENCES :

- https://www.wipo.int/edocs/pubdocs/en/intproperty/450/wipo_pub_450.pdf
- <https://www.icsi.edu/media/webmodules/publications/9.4%20Intellectual%20Property%20Rights.pdf>
- <https://lecturenotes.in/notes/20883-note-for-intellectual-property-rights-ipr-by-gyan-prakash>

20A3201612 TOWN PLANNING AND ARCHITECTURE

Lecture - Tutorial:	2-1 Hours	Internal Marks:	30
Credits:	3	External Marks:	70

Prerequisites: NONE

Course Objectives:

1. Initiating the students to different architectures of the world. The distinctions between the eastern and western architecture styles are focused.
2. The salient features of Egyptian, Greek, Roman, Indian Vedic, Indus valley civilization, Buddhist, Hindu and Indo-Sarsanic Architecture are introduced.
3. Architectural design concepts, principles of planning and composition are imparted.
4. Enabling the student to understand town planning from ancient times to modern times.
5. To impart the concepts of town planning standards, land scaping and expansion of towns.

Course Outcomes:

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

C01	The student should be able to distinguish architectural styles of eastern and western world.
C02	The student should understand the importance of Orders of architecture.
C03	Should be able to compose spaces of buildings using design concepts, planning principles.
C04	Should understand the town planning standards, landscaping features and regulations controlling expansion of the towns and the cities.
C05	Should be able to understand modern town planning and standards of town planning.
C06	Understand the Land Scaping and Expansion of Towns.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 - Low, 2-Medium, 3 - High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
C01	2	-	-	2	-	-	2	-	-	-	2	-	1	2
C02	2	-	3	3	-	-	-	-	2	-	3	3	1	2
C03	2	2	3	-	-	-	-	3	-	-	3	-	1	2
C04	2	2	-	3	-	-	-	-	-	-	3	-	1	2
C05	2	2	-	-	-	-	-	-	-	-	-	-	1	2
C06	2	-	3	-	-	-	2	-	-	-	-	-	1	2

UNIT- I

HISTORY OF ARCHITECTURE:

WESTERN ARCHITECTURE:

Egyptian, Greek, Roman Architectures- Orders.

INDIAN ARCHITECTURE:

Vedic age, Indus valley civilization. Temples of religions.

Buddhist period: Stambas, Stupas, Toranas, Chaityas, Viharas – Hindu temples:

Dravidian and Indo Aryan Styles-Temple of Aihole, Madurai, Bhuvaneshwar, Mount Abu. Indo Sarsanic (Islamic) Architecture: Mosque - Palace - Fort - Tomb.

UNIT- II**PRINCIPLES OF DESIGNING AND PLANNING:**

Principles of planning a residence- site selection, site orientation- aspect, prospect, grouping, circulation, privacy, furniture requirements, services and other factors.

POST-CLASSIC ARCHITECTURE:

Introduction of post-classic architecture- contribution of eminent architects to modern period-Edward Lutyens, Le Corbusier, Frank Lloyd Wright, Walter Groping.

UNIT- III**HISTORICAL BACK GROUND OF TOWN PLANNING:**

Town planning in India –Town plans of mythological Manasa-Town plans of ancient towns: Harappa, Mohenjodaro, Pataliputra, Delhi, Acropolis (Greece), Jerusalem, Mecca, Rome, London.

UNIT- IV**MODERN TOWN PLANNING:**

Zoning- Roads and road traffic- Housing- Slums, Parks, Play groundsPublic Utility Services- Surveys and maps for planning- Neighborhood Planning.

STANDARDS OF TOWN PLANNING:

Planning new towns, planning standards and specifications, national and regional planning, town planning and legislation-planning regulations and limitations.

UNIT-V**LAND SCAPING AND EXPANSION OF TOWNS:**

Land scaping for the towns, horizontal and vertical expansion of towns- garden cities, satellite towns- floating towns- sky scrapers-pyramidal cities.

TEXT BOOKS:

1. The great ages of World Architecture by G.K. Hiraskar.
2. Planning and Design of Buildings by Section of Architecture by Y. S. Sane.
3. Professional Practice by G.K.Krishnamurthy, S.V.Ravindra, PHI Learning, New Delhi.
4. Indian Architecture – Vol. I & II by Percy Brown, Taraporevala Publications, Bombay.
5. Fundamentals of Town Planning by G.K.Haraskar.

REFERENCE BOOKS:

1. Drafting and Design for Architecture by Hepler, Cengage Learning
2. Architect's Portable Handbook by John Patten Guthrie – McGraw.Hill International Publications.

20A3201613 ROAD SAFETY ENGINEERING

Lecture - Tutorial:	2-1 Hours	Internal Marks:	30
Credits:	3	External Marks:	70

Prerequisites: TRAFFIC ENGINEERING, HIGHWAY ENGINEERING.

Course Objectives:

1. Understand the road accidents and road safety improvement strategies.
2. Analyze the crash data using statistical methods.
3. Understand how to conduct road safety audits.
4. Understand the mechanism needed for crash reconstruction based on case studies.
5. Apply accident mitigation measures in view of safety of user on a highway.

Course Outcomes:

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

CO1	Explain the road accidents and road safety improvement strategies.
CO2	Analyze the crash data using statistical methods
CO3	Conduct road safety audits.
CO4	Explain the mechanism needed for crash reconstruction based on case studies.
CO5	Apply accident mitigation measures in view of safety of user on a highway.
CO6	Explain the traffic management measures and its influence.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 - Low, 2-Medium, 3 - High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	-	-	-	-	3	-	-	-	-	-	-		
CO2	3	2	-	3	-	3	-	-	-	-	-	-		
CO3	3	-	-	-	-	3	-	-	-	-	-	-		
CO4	3	-	-	-	-	3	-	-	-	-	-	-		
CO5	3	-	-	-	-	3	-	-	-	-	-	-		
CO6	3	-	-	-	-	3	-	-	-	-	-	-		

UNIT I

Road accidents, Trends, causes, Collision diagrams; Highway safety; Human factors and road user limitations; Speed and its effect on road safety; Vehicle factors; Highway safety in India. Multi-causal dynamic systems approach to safety; Crash Vs Accident; Road safety improvement strategies; Elements of a road safety plan, Safety data Needs; Safe vehicle design.

UNIT II**STATISTICAL INTERPRETATION AND ANALYSIS OF CRASH DATA:**

Before-after methods in crash analysis, Recording of crash data; Accident Investigation and Analysis; Statistical testing and the role of chance; Black Spot Identification and Investigations, Case Studies.

UNIT III**ROAD SAFETY AUDITS:**

Key elements of a road safety audit, Road Safety Audits & Investigations, Work zone safety audit; Crash investigation and analysis, Methods for identifying hazardous road locations, Case Studies.

UNIT IV**CRASH RECONSTRUCTION:**

Describe the basic information that can be obtained from the roadway surface, Understand basic physics related to crash reconstruction, speed for various skid, friction, drag, and acceleration scenarios, variables involved in jump and

flip crashes, variables involved in pedestrian crashes, Case Studies.

UNIT-V

MITIGATION MEASURES:

Accident prevention by better planning, Accident prevention by better design of roads, Crash Countermeasures, Highway operation and accident control measures, Highway Safety Measures during construction, Highway geometry and safety; Safety in urban areas; Public transport and safety; Road safety policy making, Stakeholders involvement; Road safety law.

TEXT BOOKS:

1. The Traffic Safety Toolbox: A Primer on Traffic Safety, ITE, 1999. Towards Safe Roads in Developing country, Institute of Transportation Engineers (ITE), TRL – ODA, 2004

REFERENCE BOOKS:

1. Traffic Control and Road Accident Prevention, Athelstan Popkess, Chapman and Hall, 1997 (Digitized 2008).
2. Observational Before-After Studies in Road Safety, Ezra Hauer, Pergamon Press, 1997 (reprinted 2002).
3. Transport Planning and Traffic Safety: Making Cities, Roads, and Vehicles Safer, Geetam Tiwari and Dinesh Mohan, CRC Press, 2016.

20A3201613 TRAFFIC ENGINEERING

Lecture - Tutorial:	2-1 Hours	Internal Marks:	30
Credits:	3	External Marks:	70

Prerequisites: HIGHWAY ENGINEERING

Course Objectives:

1. To teach basic science principles in estimating stopping and passing sight distance requirements.
2. Identify and teach traffic stream characteristics
3. Understand elements of highway safety and approaches to accident Studies.
4. To teach the importance of road safety
5. Design a pre-timed signalized intersection, and determine the signal splits.

Course Outcomes:

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

CO1	Explain principles in estimating stopping and passing sight distance requirements.
CO2	Analyze Traffic Problems And Plan For Traffic Systems Various Uses.
CO3	Conduct different types of Traffic Surveys.
CO4	Explain traffic regulation and control devices.
CO5	Design Channels, Intersections, Signals and Parking Arrangements.
CO6	Develop Traffic Management Systems.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 - Low, 2- Medium, 3 - High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	-	-	-	-	2	-	2	-	-	-	-	1	2
CO2	3	2	1	-	-	2	-	2	-	-	-	-	1	2
CO3	3	-	-	-	-	2	-	1	-	-	-	-	1	2
CO4	3	-	-	-	-	2	-	2	-	-	-	-	1	2
CO5	3	3	3	-	-	2	-	1	-	-	-	-	1	2
CO6	3	1	-	-	-	2	-	2	-	-	-	-	1	2

UNIT- I

COMPONENTS OF THE TRAFFIC SYSTEM:

Human-Vehicle-Environment System; characteristics of Road users, Vehicles, Highways and their classification; Traffic Studies: Inventories; Volume studies; Speed, Travel time and Delay studies; Intersection studies; Pedestrian studies; Parking studies; Accident studies.

UNIT- II

TRAFFIC CHARACTERISTICS:

Microscopic and macroscopic flow characteristics: Time headways; Temporal, spatial and model flow patterns; Interrupted and Un interrupted traffic. Microscopic and macroscopic speed characteristics: Vehicular speed Trajectories; Speed characteristics - Mathematical distribution; Speed and travel time variations; Travel time and delay studies. Microscopic and Macroscopic density characteristics: Distance headway characteristics; Car following theories; Density measurement techniques; Density contour maps.

UNIT- III

Traffic Control Devices & Highway Safety:

Traffic signs & Markings; Signal Warrants; Signal phasing and Development of phase plans; Fixed and Vehicle activated signals; Webster method; ARRB method;

Drew's Method; IRC method; Signal coordination; Area Traffic control. Accident characteristics – Road – Driver – Vehicle; Accident recording and Analysis; Highway Safety Improvement Program; Safety Audit.

UNIT- IV

HIGHWAY CAPACITY AND LEVEL OF SERVICE:

Capacity and level of service; Factors affecting Capacity and LOS; Capacity of Rural Highways, Capacity of Urban Roads; HCM and IRC standards.

UNIT-V

INTELLIGENT VEHICLE HIGHWAY SYSTEMS:

Traffic surveillance and monitoring; IVHS programs, Role of IVHS, IVHS categories, Benefits and Costs of IVHS, Categories of ITS.

TEXT BOOKS:

1. Traffic Engineering: Theory and Practice by Pignataro LJ., Prentice hall, Inc
2. Traffic and Transport planning by Kadiyali L.R., Khanna Publishers

REFERENCE BOOKS:

1. Traffic Engineering by Rogu P. Roess, Elena S. Prassas and William R. Mc Shane, Pearson India Education Services pvt. Ltd.
2. Traffic and Highway Engineering by Garber and Hoel, Cengage Learning India pvt. Ltd., Noida, New Delhi.

E-REFERENES :

- <https://nptel.ac.in/courses/105/101/105101008/>

20A3201621 ELEMENTS OF CIVIL ENGINEERING

Lecture – Tutorial:	2-1 Hours	Internal Marks:	30
Credits:	3	External Marks:	70

Prerequisites: STRENGTH OF MATERIALS AND ENGINEERING MECHANICS**Course Objectives:**

- To make the students to understand the concepts of stress, strain, generalized Hooke's law.
- To get exposure with the various building materials
- To understand the behavior of different soils
- To know about the fundamentals of Surveying
- to develop the focus on bridges
- To know about the fundamentals of dams and sewage disposals

Course Outcomes:**Upon successful completion of the course, the student will be able to:**

CO1	Understand the concepts of stress, strain, generalized Hooke's law.
CO2	Attain basic knowledge on civil engineering materials and civil engineering structures.
CO3	Attain basic knowledge on sub-structure and super structure of a building.
CO4	Attain basic knowledge on principles of surveying, various types of surveying
CO5	Understand the basic concepts of various types of transportation systems.
CO6	Attain basic knowledge on water supply, sewage.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3			2				3					1	2
CO2	3			2				3					1	3
CO3	3			2				3					1	3
CO4	3			2				3					1	3
CO5	3			2				3					1	3
CO6	3			2				3					1	3

UNIT I**SIMPLE STRESS AND STRAINS:**

Definition of Mechanics- External and Internal forces-Stress and Strain-Elasticity and Hook's Law- Relations between elastic constants.

CIVIL ENGINEERING MATERIALS:

Classification of bricks, Manufacture of bricks, Laboratory and field tests on bricks, stones; Grades of Steel and Cement Concrete.

UNIT II**MASONARY:**

Bonds in Brick Masonry, Stone Masonry; Types of Flooring and Roofing.

SUB-STRUCTURE:

Soil –Types; Introduction to Foundations – Classifications; Bearing capacity of Soil – Improvement.

UNIT III**SURVEYING:**

Objectives, Types, Principles of Surveying; Measurement of distances and angles

TRANSPORTATION ENGINEERING:

Roads- Classification; Road Network Patterns; Cross section of roads; Traffic signs.

UNIT IV

BRIDGES:

Necessity of bridges; Components; Classification; Preliminary data to be collected, selection of bridge site; Investigation for major bridges.

UNIT V

DAMS:

Purpose of Dams; Components; Classification; selection of site for construction.

Sewage Disposal:

Water supply - objective - quantity of water - sources - standards of drinking water - distribution system. Sewage - classification - technical terms - septic tank - components and functions.

TEXT BOOKS:

- Raju .K.V.B, Ravichandran .P.T, "Basics of Civil Engineering", Ayyappa Publications, Chennai, 2012.
- Rangwala .S.C," Engineering Material"s, Charotar Publishing House, Anand, 2012.
- Basic Civil Engineering by M.S.Palanichamy, Tata McGraw-Hill Publishing Company limited.

REFERENCE BOOKS:

- Elements of Environmental Engineering, by Dr. K.N. Duggal, S. Chand and company LTD. Ram Nagar, New Delhi.
- R.Srinivaas, Chartor Publishing House, Arand, 2012

E-REFERENCES:

- ncees.org/exmas/fe-exma/
- www.aboutcivil.com/

20A3201622 ENVIRONMENTAL ENGINEERING

Lecture – Tutorial:	2-1 Hours	Internal Marks:	30
Credits:	3	External Marks:	70

Prerequisites: ENVIRONMENTAL STUDIES**Course Objectives:**

- 1) To teach requirements of water and its treatment.
- 2) To impart knowledge on sewage treatment methodologies.
- 3) To provide facts on Air pollution and control.
- 4) To enable with design concepts of wastewater treatment units
- 5) To throw light on importance of plumbing.

Course Outcomes:**Upon successful completion of the course, the student will be able to:**

CO1	Understand about quality of water and purification process
CO2	Select appropriate technique for treatment of waste water.
CO3	Assess the impact of air pollution
CO4	Understand consequences of solid waste and its management.
CO5	Design domestic plumbing systems.
CO6	Selection of suitable treatment flow for raw water treatments.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 - Low, 2- Medium, 3 - High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	2							1					1	2
CO2	2							1					1	2
CO3	2							1					1	2
CO4	2							1					1	3
CO5	2	2	3					1					1	3
CO6	2							1					1	3

UNIT I**ESTIMATION OF QUALITY AND QUANTITY OF WATER:**

Importance and Necessity of Protected Water Supply systems; Routine water analysis - physical, chemical and bacteriological tests; Standards for drinking water; Water borne diseases, Sources of Water: Surface and Ground water, comparison of sources with reference to quality, quantity and other considerations.

UNIT II**FLOW CHART OF PUBLIC WATER SUPPLY SYSTEM:**

Water Demand and Quantity Estimation: Estimation of water demand for a town or city, Per capita Demand and factors influencing it - Types of water demands and its variations factors affecting water demand, Design Period Population Forecasting. - Capacity of storage reservoirs, Mass curve analysis.

UNIT III**TREATMENT OF WATER AND DISTRIBUTION:**

Flowchart of water treatment plant, Treatment methods: Theory and Design of Sedimentation, Coagulation, Sedimentation with Coagulation, Filtration-Slow sand and rapid sand filters; Construction and Operation; Disinfection methods- chlorination; Removal of hardness.

Distribution of Water: Requirements- Methods of Distribution system, Layouts of Distribution networks.

UNIT IV**ESTIMATION OF QUANTITY AND QUALITY OF SEWAGE:**

Estimation of sewage flow and storm water drainage – fluctuations- classification of sewerage systems – types of sewers - Hydraulics of sewers and storm drains– design diameter of sewers – appurtenances in sewerage – Man holes, Street Inlets

UNIT V**TREATMENT OF SEWAGE AND DISPOSAL:**

Primary treatment-Screens-grit chambers-grease traps– floatation– sedimentation – design of preliminary and primary treatment units. Design of septic tank

SECONDARY TREATMENT:

Aerobic and anaerobic treatment process comparison. Suspended growth process: Activated Sludge Process, principles, and operational problems, Activated Sludge Processes.

TEXT BOOKS:

1. Elements of Environmental Engineering – K. N. Duggal, S. Chand & Company Ltd., New Delhi, 2012.
2. Environmental Engineering water supply Engineering- vol. 1 Santosh kumar Garg ,Khanna Publishers 2018 edition
3. Sewage waste disposal and Air pollution Engineering Santosh kumar Garg ,Khanna Publishers 2018 edition

REFERENCE BOOKS:

1. Environmental Engineering, D. Srinivasan, PHI Learning Private Limited, New Delhi, -2011 edition.
2. Wastewater engineering treatment and reuse - Metclff & Eddy McGraw Hill Education (India) private Limited- 2003 edition

E-REFERENCES:

20A3201623 DISASTER MANAGEMENT

Lecture – Tutorial:	2-1 Hours	Internal Marks:	30
Credits:	3	External Marks:	70

Prerequisites: NONE**Course Objectives:**

- To explain concepts of fluid mechanics used in Civil Engineering.
- To explain basics of statics, kinematics and dynamics of fluids and various measuring techniques of hydrostatic forces on objects.
- To impart ability to solve engineering problems in fluid mechanics.
- To enable the student's measure quantities of fluid flowing in pipes, tanks and channels.
- To teach integral forms of fundamental laws of fluid mechanics to predict relevant pressures, velocities and forces.
- To strengthen the students with fundamentals useful in application-intensive courses dealing with hydraulics, hydraulic machinery and hydrology in future courses.

Course Outcomes:**Upon successful completion of the course, the student will be able to:**

CO1	Understand the principles of fluid statics, kinematics and dynamics
CO2	Familiarize basic terms used in fluid mechanics
CO3	Understand flow characteristics and classify the flows
CO4	Apply the continuity, momentum and energy principles
CO5	Estimate various losses in flow through channels
CO6	Understand fundamentals of kinematics and equations Cartesian coordinates.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3					2		1					1	2
CO2	3												1	2
CO3	3												1	2
CO4	3	2		3				2					1	3
CO5	2	2		3				2					1	3
CO6	2	2		2									1	3

UNIT I**INTRODUCTION:**

Hazard, Risk, Vulnerability, Disaster, Meaning, Nature, Importance, Dimensions & Scope of Disaster Management, Disaster Management Cycle.

NATURAL DISASTERS:

Natural Disasters- Meaning and nature of natural disasters, their types and effects, Hydrological Disasters - Flood, Flash flood, Drought, Geological Disasters- Earthquakes, Tsunamis, Landslides, Avalanches, Volcanic eruptions, Mudflow.

UNIT II**TYPES OF NATURAL DISASTERS:**

Wind related- Cyclone, Storm, Storm surge, Tidal waves, Heat and cold Waves, Climatic Change, Global warming, Sea Level rise, Ozone Depletion.

UNIT III**MAN – MADE DISASTERS:**

CBRN – Chemical disasters, biological disasters, radiological disasters, nuclear disasters, Fire – building fire, coal fire, forest fire, Oil fire.

UNIT IV

TYPES OF MAN – MADE DISASTERS:

Accidents- road accidents, rail accidents, air accidents, sea accidents, Pollution - air pollution, water pollution, Deforestation, Industrial waste.

UNIT V

DISASTER DETERMINANTS:

Factors affecting damage – types, social status, habitation pattern, physiology and climate, Factors affecting mitigation measures, prediction, preparation, communication, area and accessibility, population, physiology and climate.

TEXT BOOKS:

- Disaster Management Guidelines, GOI-UND Disaster Risk Program (2009-2012).
- Damon, P. Copola, (2006) Introduction to International Disaster Management, Butterworth Heineman.
- Gupta A.K., Niar S.S and Chatterjee S. (2013) Disaster management and Risk Reduction, Role of Environmental Knowledge, Narosa Publishing House, Delhi.

REFERENCE BOOKS:

- Murthy D.B.N. (2012) Disaster Management, Deep and Deep Publication PVT. Ltd. New Delhi.
- Modh S. (2010) Managing Natural Disasters, Mac Millan publishers India LTD.

E-REFERENCES:

20A3201691 ESTIMATION, COSTING & CONTRACTS LAB

Practical	3 Hours	Internal Marks:	40
Credits:	1.5	External Marks:	60

Prerequisites: Quantity Surveying, Concrete Technology, BMC

Course Outcomes:

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

CO1 Able to apply the knowledge of quantities for structural components.

CO2 Able to Prepare documents for different types of contracts.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 - Low, 2- Medium, 3 - High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	-	-	-	-	-	-	-	3	2	-	-	2	2	3
CO2	-	-	-	-	-	-	-	3	2	-	-	2	2	3

List of Experiments

1. Estimation of building (long wall and short wall method).
2. Estimation of building (centre line method).
3. Analysis of rate for concrete work.
4. Analysis of rate for brick work.
5. Analysis of rate for plaster work.
6. Estimate quantity of reinforcement.
7. Preparation for approximate estimate for road project.
8. Estimating cost of building on plinth area method.
9. Prepare the contract agreement for a new construction of residential Building.

20A3201692 MX ROADS SOFTWARE LAB

Practical	3 Hours	Internal Marks:	40
Credits:	1.5	External Marks:	60

Prerequisites: NONE**Course Outcomes:****Upon successful completion of the course, the student will be able to:**

CO1	Able to get the knowledge of Mx roads software.
CO2	Able to apply the knowledge of importing the survey data
CO3	Able to apply the knowledge of designing cross sectional elements on a pavement.
CO4	Able to apply the knowledge of designing the pavements.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 - Low, 2- Medium, 3 - High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	3	3	-	-	3	-	3	3	-	-	3	2	3
CO2	3	3	3	-	-	3	-	3	3	-	-	3	2	3
CO3	3												2	3
CO4	3												2	3

List of Experiments

1. THE SOFTWARE AND INTRODUCTION
2. IMPORTING THE SURVEY DATA AND SURFACE CREATION
3. HORIZONTAL ALIGNMENT DESIGN
4. VERTICAL PROFILE DESIGN
5. DESIGN OF CARRIAGEWAYS WITH CAMBER
6. DESIGN OF SUPERELEVATION
7. PAVEMENT DESIGN
8. CUT AND FILL EXTRACTION
9. CREATIONG CROSS SECTION AND LONG SECTIONS

20A3201693 STRUCTURAL DESIGNING AND DRAWING USING SOFTWARE'S

Practical	3 Hours	Internal Marks:	40
Credits:	1.5	External Marks:	60

Prerequisites: CIVIL ENGINEERING ELEMENTS**Course Outcomes:****Upon successful completion of the course, the student will be able to:**

CO1	Evaluate cross sectional and reinforcement requirements of various structural elements by using STAAD.Pro
CO2	Evaluate quantities and prepare rate analysis for various works in construction of a building using Spread Sheets

Contribution of Course Outcomes towards achievement of Program Outcomes (1 - Low, 2-Medium, 3 - High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	3	3	-	-	3	-	3	3	-	-	3	2	3
CO2	3	3	3	-	-	3	-	3	3	-	-	3	2	3

List of Experiments**PART-A**

Analysis of the following concrete & steel structural elements using STAAD. Pro Software.

- Design of continuous beam.
- Design of plane frame
- Design of space frame.
- Design of G+4 Residential building: Creating model from the given drawing, Assigning Loads and Load Combinations
- Design of G+4 Residential building: Creating model from the given drawing, Assigning Lateral Loads
- Design of G+4 Residential building: Preparation of detail drawing, Preparation of Design Documents
- Design of Roof Truss

PART - B

- Estimate & Working out rates using spread sheets for the different items in a single Story building.
- Demonstration of software's ETABS

20A3201694 SKILL ADVANCED COURSE

Practical	3 Hours	Internal Marks:	40
Credits:	1.5	External Marks:	60

Prerequisites: CIVIL ENGINEERING ELEMENTS**Course Outcomes:****Upon successful completion of the course, the student will be able to:**

CO1 Conduct survey and collect field samples.

CO2 Prepare field notes from soil data

CO3 Designing of a residential building

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2-Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	3	3	-	-	3	-	3	3	-	-	3	2	3
CO2	3	3	3	-	-	3	-	3	3	-	-	3	2	3
CO3	3												2	3

List of Experiments**COURSE CONTENT :**

Collection of soil samples and calculating bearing capacity of soil samples.

COURSE CONTENT

Manual design of a G+2 residential building and draw plans using AUTO-CAD.

20A3200801 EMPLOYABILITY SKILLS

Lecture – Tutorial:	2-1 Hours	Internal Marks:	30
Credits:	3	External Marks:	70

Prerequisites: NONE**Course Objectives:**

- Understand the Aptitude and reasoning skills.
- Develop the Soft skills, attitude, confidence.
- Develop Skills required for campus placement interview.
- Understand the emotional intelligence and conflict management.
- Develop the resume preparation and interview skills.

Course Outcomes:**Upon successful completion of the course, the student will be able to:**

- CO1 Solve aptitude and reasoning problems
- CO2 Apply the soft skills in dealing the issues related to employability
- CO4 Develop the leadership skills, time and stress management ability.
- CO5 Able to participate in group discussions and campus placement drive.
- CO6 Apply the simulated testing.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3					2		1						
CO2	3													
CO3	3													
CO4	3	2		3				2						
CO5	2	2		3				2						
CO6	2	2		2										

UNIT I**GRAMMAR:**

Sentence Construction, Sentence Correction, Error Identification, Essentials of Grammar

UNIT II**COMMUNICATION SKILLS:**

Speaking Techniques and Strategies, Technical Communication, Effective Communication, Functional English, Advanced Vocabulary.

SOFT SKILLS:

Interpersonal Skills, Positive Thinking, Time Management, Team Work, Critical thinking,, Professional Ethics and Morals, Leadership Skills, Goal Setting, Decision Making Skills, Problem Solving Skills, Entrepreneurship Skills.

UNIT III**PRESENTATION SKILLS:**

Listening Skills, Active Listening, Speaking Techniques and Strategies, Body Language, Personal Grooming, Interviews, Group Discussion.

UNIT IV**WRITING SKILLS:**

Job Application, Resume, Business Communication, Essay Writing, Paragraph Writing, E-mail, Report Writing, Writing Proposals, Note Making/Taking.

UNIT V

READING SKILLS:

Comprehension, Making Inferences, Précis Writing, Paraphrasing/Jumbled Sentences, Interpretation of Pictures

TEXT BOOKS:

- Effective Technical Communication by M. Ashraf Rizvi, published by Tata McGraw Hill.
- Technical Communication Principles and Practice by Meenakshi Raman and Sangeeta Sharma, published by Oxford Higher Education.
- Effective Communication and Soft Skills – Strategies for Success by Nitin Bhatnagar and Mamata Bhatnagar, Published by Pearson.

REFERENCE BOOKS:


- Personality Development and Soft Skills by Barun Mitra, published by Oxford University Press.
- Soft Skills - Enhancing Employability; Connecting Campus with Corporate by M.S.Rao, published by IK International Publishing House Pvt. Ltd.

E-REFERENCES:

20A3200801 INDUSTRIAL/RESEARCH INTERNSHIP

Practical	3 Hours	Internal Marks:	40
Credits:	1.5	External Marks:	60

**INDUSTRIAL/RESEARCH INTERNSHIP (MANDATORY) 2 MONTHS.
TO BE EVALUATED IN IV YEAR I SEMESTER**

 <p>NRI INSTITUTE OF TECHNOLOGY Kakinada A.P. AUTONOMOUS</p>	<p align="center">NRI INSTITUTE OF TECHNOLOGY (AUTONOMOUS) Approved by AICTE, New Delhi: Permanently Affiliated to JNTUK, Kakinada Accredited by NAAC with "A" GRADE, Accredited by NBA (CSE, ECE&EEE) An ISO 9001:2015 Certified Institution Pothavarappadu (V), Agiripalli (M), Eluru District, A.P., India, Pin: 521 212 URL: www.nriit.edu.in, email: principal@nriit.edu.in, Mobile: + 91 8333882444</p>	 
--	--	--

DEPARTMENT OF CIVIL ENGINEERING

COURSE STRUCTURE FOR FOURTH YEAR B. TECH PROGRAMME

IV YEAR I SEMESTER

S.No	Course Code	Title of the Course	Scheme of Instruction (Periods Per Week)				Scheme of Examination (Maximum Marks)			No. of Credits
			L	T	P	Total	CIA	SEA	Total	
1	20A4101513	PROFESSIONAL ELECTIVE COURSE – III ADVANCED STRUCTURAL ENGINEERING BRIDGE ENGINEERING PRE-STRESSED CONCRETE URBAN TRANSPORTATION PLANNING	3	0	0	3	30	70	100	3
2	20A4101521	PROFESSIONAL ELECTIVE COURSE – IV Ground Improvement Techniques Geo-Spatial Technologies Disaster Management & Mitigation Soil dynamics & Machine Foundations	3	0	0	3	30	70	100	3
3	20A4101531	PROFESSIONAL ELECTIVE COURSE – V Design & Drawing of Irrigation Structures Earth & Rock fill Dams Urban Hydrology SWAYAM / NPTEL / MOOCS COURSES (12 weeks duration)	3	0	0	3	30	70	100	3
4	20A4103613	OPEN ELECTIVE COURSE/ JOB ORIENTED ELECTIVE (OE-III) HIGHWAY ENGINEERING SAFETY ENGINEERING ENVIRONMENTALMANAGEMENT URBAN PLANNING	3	0	0	3	30	70	100	3
5		OPEN ELECTIVE COURSE/ JOB ORIENTED ELECTIVE (OE-IV) GREEN ENERGY AIR POLLUTION & CONTROL ENGINEERING PROJECT MANAGEMENT	3	0	0	3	30	70	100	3

		REMOTE SENSING & GIS								
6	20A4100101	UNIVESAL HUMAN VALUES	3	0	0	3	30	70	100	3
7	20A4100102	SKILL ADVANCED COURSE: PROJECT PLANNING, TOWN PLANNING	1	0	2	3	15	35	50	2
8	20A4101 791	INDUSTRIAL/RESEARCH INTERNSHIP: 2 Months (Mandatory) after third year (to be evaluated during VII semester)	0	0	3	3	15	35	100	3
Total			16	0	5	26	180	420	600	23

IV YEAR II SEMESTER

Sl. No	Course Code	Title of the Course	Scheme of Instruction (Periods Per Week)				Scheme of Examination (Maximum Marks)			No. of Credits
			L	T	P	Total	CIA	SEA	Total	
1	20A4201791	PROJECT	0	0	0	0	30	70	100	12
	20A42017 92	COMMUNITY SERVICE PROJECT	0	0	0	0				
Total			INTERNSHIP (6 MONTHS)							12

ANALYSIS & DESIGN OF PRE-STRESSED CONCRETE MEMBERS

UNIT- I

Introduction:

Historic Development- General Principles of pre-stressing- Pre-tensioning and post tensioning- Advantages and Limitations of Pre-stressed concrete-materials. High strength of concrete and high strength of steel and their characteristics.

Pre-stressing Methods:

IS Code Provisions, Methods and systems of Pre-stressing; Pre-tensioning and Post tensioning methods- Different systems of Pre-stressing like Hoyer system, Magnel Blaton system, Freyssinet's system and Gifford Udall System.

UNIT II

Analysis of Sections for Flexure:

Stress Analysis of sections for flexure; stress concept, strength concept, load balancing concept, beams pre-stressed with straight, Concentric, Eccentric, Bent and Parabolic tendons, C-line, P-line.

UNIT III

Losses of Pre-stress:

Loss of pre-stress in pre-tensioned and post tensioned members due to Elastic Shortage of concrete, Shrinkage of concrete, Creep of concrete, Relaxation of steel, slip in anchorage bending of member and frictional losses- total and allowable loss of pre-stress for design.

UNIT IV

Design of Sections for Flexure and Shear: Allowable stress, Design criteria as per IS code- Elastic design of simple rectangular and I-section for Flexure, shear, and Principal stresses- Design for shear in beam- ultimate shear resistance.

UNIT V

Deflections of Pre-stressed concrete Beams: Importance of control of Deflections- Factors influencing deflections- Codal requirements for deflections- short term deflections of un-cracked members- prediction of long term deflections, Deflections of cracked members.

Ground Improvement Techniques

UNIT-I

DENSIFICATION OF SOIL : In situ densification methods- in situ densification of granular soils- vibration at ground surface and at depth, impact at ground and at depth – in situ densification of cohesive soils – pre loading – vertical drains – sand drains geo drains and stone columns

UNIT II

DEWATERING TECHNIQUES : Dewatering – sumps and interceptor ditches – single and multi-stage well points – vacuum well points – horizontal wells – criteria for choice of filler material around drains – electro osmosis.

UNIT III

STABILIZATION AND GROUTING: Stabilization of soils – methods of soil stabilization – mechanical – cement – lime – bitumen and polymer stabilization – use of industrial wastes like fly ash and granulated blast furnace slag. Grouting – objectives of grouting – grouts and their applications – methods of grouting – stage of grouting – hydraulic fracturing in soils and rocks – post grout tests. Introduction to Liquefaction & its effects & applications.

UNIT IV

REINFORCE EARTH OF SOIL : Reinforce earth – principles – components of reinforced earth – design principles of reinforced earth walls – stability checks – soil nailing.

UNIT V

GEOSYNTHETICS OF SOIL : Geosynthetics – geotextiles – types – functions , properties and applications – geogrids , geomembranes and gabions - properties and applications.

Design & Drawing of Irrigation Structures

UNIT I
Design and drawing of Surplus weir.
UNIT II
Design and drawing of Tank sluice with a tower head.
UNIT III
Design and drawing of Canal drop-Notch type.
UNIT IV
Design and drawing of Canal regulator.
UNIT V
Design and drawing of Syphon aqueduct type III.

SAFETY ENGINEERING

UNIT - I

INTRODUCTION TO THE DEVELOPMENT OF INDUSTRIAL SAFETY AND

MANAGEMENT: History and development of Industrial safety: Implementation of factories act, Safety and productivity, Safety organizations. Safety committees and structure, Role of management and role of Govt. in industrial safety.

UNIT - II

ACCIDENT PREVENTIONS AND PROTECTIVE EQUIPMENT: Personal protective Equipment, Survey the plant for locations, Part of body to be protected, Education and training in Safety, Prevention causes and cost of accident, Housekeeping, First aid, Accident reporting, Investigations. Industrial psychology in accident prevention, Safety trials, Safety related to operations.

UNIT - III

SAFETY ACTS: Features of Factory Act, Introduction of Explosive Act, Boiler Act, ESI Act, Workman's compensation Act, Industrial hygiene, Occupational safety, Diseases prevention, Ergonomics, Occupational diseases, stress, fatigue, health, safety and the physical environment, Engineering methods of controlling chemical hazards, safety and the physical environment, Control of industrial noise and protection against it.

UNIT - IV

FIRE PREVENTION AND PROTECTION: Sources of ignition – fire triangle – principles of fire Extinguishing – active and passive fire protection systems – various classes of fires – A, B, C, D, E- fire extinguishing agents – types of fire extinguishers – fire stoppers – hydrant pipes – hoses – Monitors – fire watchers – fire station- fire alarms and sirens – escape from fire rescue operations – Fire drills – first aid for burns.

UNIT - V

BUILDING FIRE SAFETY: Objectives of fire safe building design, fire load, fire resistant material and fire testing – structural fire protection – structural integrity – concept of egress design - A case Study on Construction Safety - Contractual Provision on Construction Zone Safety

ELECTRICAL SAFETY - Electrical shock, electrical hazards and preventions, Nature of electrical Accidents, National electrical standards

GREEN ENERGY

UNIT–I Solar Energy: Introduction - Renewable Sources - prospects, Solar radiation at the Earth

Surface - Equivalent circuit of a Photovoltaic (PV) Cell - I-V & P-V Characteristics - Solar Energy

Collectors: Flat plate Collectors, concentrating collectors - Solar Energy storage systems and Applications: Solar Pond - Solar water heating - Solar Green house.

UNIT–II Wind Energy: Introduction - basic Principles of Wind Energy Conversion, the nature of Wind -

the power in the wind - Wind Energy Conversion - Site selection considerations - basic components of

Wind Energy Conversion Systems (WECS) - Classification - Applications.

UNIT–III Biomass and Geothermal Energy: Biomass: Introduction - Biomass conversion technologies

- Photosynthesis, factors affecting Bio digestion - classification of biogas plants - Types of biogas plants

- selection of site for a biogas plant .Geothermal Energy: Introduction, Geothermal Sources – Applications - operational and Environmental problems.

UNIT–IV Energy From oceans, Waves & Tides: Oceans: Introduction - Ocean Thermal Electric

Conversion (OTEC) – methods - prospects of OTEC in India. Waves: Introduction - Energy and Power

from the waves - Wave Energy conversion devices. Tides: Basic principle of Tide Energy - Components

of Tidal Energy.

UNIT–V Chemical Energy Sources: Fuel Cells: Introduction - Fuel Cell Equivalent Circuit –

Hydrogen Energy: Introduction - Methods of Hydrogen production - Storage and Applications

Magneto Hydro Dynamic (MHD) Power generation: Principle of Operation - Types.

UNIVESAL HUMAN VALUES

Course Content(Syllabus)
UNIT I
Introduction - Need, Basic Guidelines, Content and Process for Value Education: pose and motivation for the course, recapitulation from Universal Human Values-I, Self-Exploration–what is it? - Its content and process; ‘Natural Acceptance’ and Experiential Validation- as the process for self-exploration, Continuous Happiness and Prosperity- A look at basic Human Aspirations, Right understanding, Relationship and Physical Facility- the basic requirements for fulfilment of aspirations of every human being with their correct priority, Understanding Happiness and Prosperity correctly- A critical appraisal

of the current scenario, Method to fulfil the above human aspirations: understanding and living in harmony at various levels

UNIT II

Understanding Harmony in the Human Being - Harmony in Myself! Understanding human being as

a co-existence of the sentient 'I' and the material 'Body', Understanding the needs of Self ('I') and 'Body' - happiness and physical facility, Understanding the Body as an instrument of 'I' (I being the doer, seer and enjoyer), Understanding the characteristics and activities of 'I' and harmony in 'I',

Understanding the harmony of I with the Body: Sanyam and Health; correct appraisal of Physical needs, meaning of Prosperity in detail, Programs to ensure Sanyam and Health

UNIT III

Understanding Harmony in the Family and Society- Harmony in Human Relationship:

Understanding values in human-human relationship; meaning of Justice (nine universal values in relationships) and program for its fulfilment to ensure mutual happiness; Trust and Respect as the foundational values of relationship. Understanding the meaning of Trust; Difference between intention and competence, Understanding the meaning of Respect, Difference between respect and differentiation;

the other salient values in relationship, Understanding the harmony in the society (society being an extension of family): Resolution, Prosperity, fearlessness (trust) and co-existence as comprehensive Human Goals, Visualizing a universal harmonious order in society- Undivided Society, Universal Order- from family to world family Order- from family to world family

UNIT IV

Understanding Harmony in the Nature and Existence - Whole existence as Coexistence: Understanding the harmony in the Nature, Interconnectedness and mutual fulfilment among the four orders of nature- recyclability and self regulation in nature, Understanding Existence as Co-existence of mutually interacting units in all- pervasive space, Holistic perception of harmony at all levels of existence

UNIT V

Implications of the above Holistic Understanding of Harmony on Professional Ethics: Natural acceptance of human values, Definitiveness of Ethical Human Conduct, Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order, Competence in professional ethics: Ability to utilize the professional competence for augmenting universal human order b. Ability to identify the scope and characteristics of people friendly and eco-friendly production systems, c. Ability to identify and develop appropriate technologies and management patterns for above production systems. Case studies of typical holistic technologies, management models and production systems, Strategy for transition from the present state to Universal Human Order: a. At the level of individual: as socially and ecologically responsible engineers, technologists and managers b. At the level of society: as mutually enriching institutions and organizations