JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India
DEPARTMENT OF CIVIL ENGINEERING

COURSE STRUCTURE AND SYLLABUS

For UG – R20

B. TECH - CIVIL ENGINEERING

(Applicable for batches admitted from 2020-2021)

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA

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COURSE STRUCTURE

I Year – I SEMESTER

S. No	CourseCode	Subjects	L	T	P	Credits
1	BSC1101	Mathematics – I (Calculus & Differential Equations)	3	0	0	3
2	HSMC1101	Communicative English	3	0	0	3
3	BSC1102	Engineering Physics	3	0	0	3
4	ESC1101	Engineering Drawing	1	0	4	3
5	ESC1102	Engineering Geology (Integrated) (Theory & Lab)	2	0	2	3
6	HSMC1102	English Communication Skills Laboratory	0	0	3	1.5
7	BSC1103	Engineering Physics Lab	0	0	3	1.5
8	ESC1103	Basics of Civil Engg. Work Shop (Lab)	0	0	3	1.5
Total Credits			**19.5**			

I Year – II SEMESTER

S. No	Course Code	Subjects	L	T	P	Credits
1	BSC1201	Mathematics – II (Linear Algebra & Numerical Methods)	3	0	0	3
2	BSC1202	Engineering Chemistry	3	0	0	3
3	ESC1201	Engineering Mechanics	3	0	0	3
4	ESC1202	Programming for Problem Solving Using C	3	0	0	3
5	ESC1203	Building Materials and Concrete Technology	3	0	0	3
6	BSC1203	Engineering Chemistry Lab	0	0	3	1.5
7	ESC1204	Programming for problem Solving Using C Lab	0	0	3	1.5
8	ESC1205	Building Planning and Computer Aided Building Drawing	0	0	3	1.5
9	MC1201	Environmental Science (M. C)	2	0	0	0
Total Credits			**19.5**			

***Breakup of credits for Engineering Graphics/Engineering Workshop shall be 1-0-4 (as perAICTE model curriculum)**
Universities/Institutions may swap a few courses between 1st and 2nd semesters to balance the workload of teaching and laboratory schedule.

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II Year – I SEMESTER

S. No	Course Code	Course Title	L	T	P	Credits
1	BSC301	Mathematics -III (Vector Calculus, Transforms and PDE)	3	0	0	3
2	PCC301	Strength of Materials - I	3	0	0	3
3	PCC302	Fluid Mechanics	3	0	0	3
4	PCC302	Surveying and Geometrics	3	0	0	3
5	PCC303	Highway Engineering	3	0	0	3
6	PCC304	Concrete Technology Lab	0	0	3	1.5
7	PCC305	Highway Engineering Lab	0	0	3	1.5
8	PCC306	Surveying Field Work – I (Lab)	0	0	3	1.5
9	SC301	**Skill oriented course***	1	0	2	2
10	MC301	Constitution of India	2	0	0	0
		Total Credits				**21.5**

II YEAR – II SEMESTER

S. No.	Course Code	Course Title	L	T	P	Credits
1	PC401	Complex Variables and Statistical Methods	3	0	0	3
2	PC402	Strength of Materials -II	3	0	0	3
3	ES401	Hydraulics and Hydraulic Machinery	3	0	0	3
4	PC403	Environmental Engineering	3	0	0	3
5	PC404	Managerial Economics & Financial Analysis	3	0	0	3
6	PC405	Environmental Engineering Lab	0	0	3	1.5
7	PC406	Strength of Material Lab	0	0	3	1.5
8	PC407	Fluid Mechanics & Hydraulics Machinery Lab	0	0	3	1.5
9	SC401	**Skill oriented course***	1	0	2	2
		Total Credits				**21.5**
Honors/ Minor courses (The hours distribution can be 3-0-2 or 3-1-0 also)			3	1	0	4

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III YEAR – I SEMESTER

S. No.	Course Code	Course Title	L	T	P	Credits
1	PC501	Professional Core courses (STRUCTURAL ANALYSIS)	3	0	0	3
2	PC502	Professional Core courses (DESIGN AND DRAWING OF REINFORCED CONCRETE STRUCTURES)	3	0	0	3
3	PC503	Professional Core courses (GEOTECHNICAL ENGINEERING-1)	3	0	0	3
4	OE501	Open Elective Course/Job Oriented elective (OE-1)	3	0	0	3
5	PE501	Professional Elective courses	3	0	0	3
6	PC504	Professional Core courses Lab Survey Camp (Field work)	0	0	3	1.5
7	PC505	Professional Core courses Lab (GEOTECHNICAL ENGINEERING LAB)	0	0	3	1.5
8	PC501	Skill advanced course/ soft skill course* Design of Special Structure, Chimney, Hinge Tanks designs, spill ways etc.,	1	0	2	2
9	MC501	Mandatory Course (AICTE Suggested) Professional Ethics and Human Values	2	0	0	0
10	PR501	Summer Internship 2Months (Mandatory) after second year (to be evaluated during V semester)	0	0	3	1.5
		Total Credits				**21.5**
Honors/ Minor courses (The hours distribution can be 3-0-2 or 3-1-0 also)			3	1	0	4

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III YEAR – II SEMESTER

S. No.	Course Code	Course Title	L	T	P	Credits
1	PC601	Professional Core courses (DESIGN AND DRAWING OF STEEL STRUCTURES)	3	0	0	3
2	PC602	Professional Core courses (WATER RESOURCE ENGINEERING)	3	0	0	3
3	PC603	Professional Core courses (GEOTECHNICAL ENGINEERING-II)	3	0	0	3
4	PE601	Professional Elective courses	3	0	0	3
5	OE601	Open Elective Course/Job oriented elective (OE-2)	3	0	0	3
6	PC604	Professional Core courses Lab (ESTIMATION, COSTING AND CONTRACTS)	0	0	3	1.5
7	PC605	Professional Core courses Lab (REMOTE SENSING & GIS LAB)	0	0	3	1.5
8	PC606	Professional Core courses Lab CIVIL ENGINEERING PRACTICE	0	0	3	1.5
9	SC601	Skill advanced course/ soft skill course* Computational Tools	1	0	2	2
10	MC601	Mandatory course (AICTE) (EMPLOYABILITY SKILLS)	2	0	0	0
11	*PR601	Industrial/Research Internship (Mandatory) 2 Months	0	0	3	0
		Total Credits				**21.5**
Honors/ Minor courses (The hours distribution can be 3-0-2 or 3-1-0 also)			3	1	0	4

***** At the end of III Year II semester, students shall complete summer internship spanning for 2 months at Industries / Higher Learning Institutions / APSSDC.

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IV YEAR – I SEMESTER

S. No.	Course Code	Course Title	L	T	P	Credits
1	PE701	Professional Elective -III	3	0	0	3
2	PE702	Professional Elective -IV	3	0	0	3
3	PE703	Professional Elective -V	3	0	0	3
4	OE701	Open Elective Courses/ Job oriented elective (OE-III)	2	0	2	3
5	OE702	Open Elective Course/Job oriented elective (OE-IV)	2	0	2	3
6	HSC701	*Humanities and Social Science Elective	3	0	0	3
7	SC701	Skill advanced course/ soft skill course* Project planning, town planning,	1	0	2	2
8	PR701	Industrial/Research Internship 2 Months (Mandatory) after third year (to be evaluated during VII semester)	0	0	3	3
		Total Credits				**23**
Honors/ Minor courses (The hours distribution can be 3-0-2 or 3-1-0 also)			3	1	0	4

***There is a provision for the Universities/Institutions to implement AICTE mandatory course "Universal Human Values 2: Understanding Harmony" under Humanities and social science Elective in seventh semester for 3 credits.**

IV YEAR – II SEMESTER

S.NO	CATEGORY	COURSE TITLE	L	T	P/D	C
1	Major Project	PROJ	-	-	-	12
		INTERNSHIP (6 Months)				
		Total Credits				**12**

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Professional Electives R20 (5 PE x 3 = 15 Credits)
(Department can offer Maximum 2 Subjects from Each PE, elected by the students)
Note: Student must choose subjects which were not opted earlier
PE starts from III-I

rofessional Elective-I	**Professional Elective-II**	**Professional Elective-III**	**Professional Elective-IV**	**Professional Elective-IV**
a) Construction Technology &Management	a) Advanced Structural Analysis	a) Advanced Structural Engineering	a) Ground Improvement Techniques	a) Design & Drawing of Irrigation Structures
b) Remote Sensing and GIS	b) Architecture and Town Planning	b) Bridge Engineering	b) Geo-Spatial Technologies	b) Earth & Rock fill Dams
c)Environmental Impact Assessment	c) Road Safety Engineering	c) Structural Dynamics	c) Disaster Management & Mitigation	c) Urban Hydrology
d) Low Cost Housing	d) Traffic Engineering	d)Urban Transportation Planning	d) Soil dynamics & Machine Foundations	SWAYAM / NPTEL /MOOCS COURSES (12 weeks duration)

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HONORS R20 (Starts from II-II)

(4 x 4 + 2 MOOCS/NPTEL x 2 = 20 Credits) for Civil Engg. Students
Note: Student must choose subjects which were not opted earlier
(Any FOUR courses may be chosen by the Student from each Pool)

Structural Engineering	**Geotechnical Engineering**	**Environment and Water Resource Engineering**	**Transportation Engineering**	**Construction Technology and Management**
Finite Element Methods	Reinforced Soil Structures	Urban Hydrology	Traffic Engineering	Construction Technology and Management
Matrix Analysis of Structures	Advanced Foundation Engineering	Water and Wastewater Management	Intelligent Transportation System	Architecture & Town Planning
Earthquake Resistant Design	Earth Retaining Structures	Water Resources Planning and Management	Railway, Harbor and Airport Engineering	Repairs and Maintenance of Structures
Pre-stressed concrete	Geoenvironmental Engineering	Environmental Impact Assessment	Pavement Management System	Disaster Management and Mitigation
Repair & Retro-fitting of Buildings	Earth & Rock Fill Dams	Air Pollution and Control	Urban Transportation Planning	Precast and Prefabricated Structures

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OPEN ELECTIVES R20
(4 OE x 3 = 12 Credits)
Note: Student must choose subjects which were not opted earlier.
(OE Starts from III-I)

Open Elective-I/ Open Elective-III (Offered in Odd Semesters)	**Open Elective-II/ Open Elective-IV (Offered in Even Semesters)**
a) Strength of Materials	a) Elements of Civil Engineering
b) Fluid Mechanics	b) Environmental Engineering
c) Surveying and Geomatics	c) Disaster Management
d) Highway Engineering	d) Water Resource Engineering
e) Safety Engineering	e) Hydraulics and Hydraulic Machinery
f) Environmental Management	f) Green Technologies
g) Urban Planning	g) Remote Sensing & GIS

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Minor R20 (Starts from II-II)
(4 x 4 + 2 MOOCS/NPTEL x 2 = 20 Credits)

Note: Student must choose subjects which were not opted earlier

Minor-I/Minor-III (Offered in Odd Semesters)	**Minor-II/Minor-IV (Offered in Even Semesters)**
a) Environmental Engineering and Management	a) Construction Technology and Infrastructure Management
b) Solid Mechanics	b) Seismology and Earthquake Engineering
c) Irrigation Engineering	c) Railways, Harbours and Docks
d) Geoinformatics	d) Architecture and Smart City

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I Year - I Semester		L	T	P	C
		3	0	0	3
MATHEMATICS – I (CALCULUS & DIFFERENTIAL EQUATIONS) (BSC1101) **(Common to ALL branches of First Year B.Tech)**					

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

- utilize mean value theorems to real life problems (L3)
- solve the differential equations related to various engineering fields (L3)
- familiarize with functions of several variables which is useful in optimization (L3)
- apply double integration techniques in evaluating areas bounded by region (L3)
- students will also learn important tools of calculus in higher dimensions. Students will become familiar with 2- dimensional and 3-dimensional coordinate systems (L5)

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

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

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 – Electrical circuits.

UNIT – III: Linear differential equations of higher order: (10 hrs)

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.

Applications: LCR circuit, Simple Harmonic motion.

UNIT – IV: Partial differentiation: (10 hrs)

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 method.

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UNIT – V: Multiple integrals: **(8 hrs)**

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.

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I Year - I Semester		L	T	P	C
		3	0	0	3
COMMUNICATIVE ENGLISH (HSMC1101)					

Introduction

The course is designed to train students in receptive (listening and reading) as well as productive and interactive (speaking and writing) skills by incorporating a comprehensive, coherent and integrated approach that improves the learners' ability to effectively use English language in academic/ workplace contexts. The shift is from *learning about the language* to *using the language*. On successful completion of the compulsory English language course/s in B.Tech., learners would be confident of appearing for international language qualification/proficiency tests such as IELTS, TOEFL, or BEC, besides being able to express themselves clearly in speech and competently handle the writing tasks and verbal ability component of campus placement tests. Activity based teaching-learning methods would be adopted to ensure that learners would engage in actual use of language both in the classroom and laboratory sessions.

Course Objectives

- Facilitate effective listening skills for better comprehension of academic lectures and English spoken by native speakers
- Focus on appropriate reading strategies for comprehension of various academic texts and authentic materials
- Help improve speaking skills through participation in activities such as role plays, discussions and structured talks/oral presentations
- Impart effective strategies for good writing and demonstrate the same in summarizing, writing well organized essays, record and report useful information
- Provide knowledge of grammatical structures and vocabulary and encourage their appropriate use in speech and writing

Learning Outcomes

At the end of the module, the learners will be able to

- understand social or transactional dialogues spoken by native speakers of English and identify the context, topic, and pieces of specific information
- ask and answer general questions on familiar topics and introduce oneself/others
- employ suitable strategies for skimming and scanning to get the general idea of a text and locate specific information
- recognize paragraph structure and be able to match beginnings/endings/headings with paragraphs
- form sentences using proper grammatical structures and correct word forms

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Unit 1:

Lesson-1: A Drawer full of happiness from "**Infotech English**", Maruthi Publications

Lesson-2: Deliverance by Premchand from "**The Individual Society",**Pearson Publications. (Non-detailed)

Listening: Listening to short audio texts and identifying the topic. Listening to prose, prose and conversation.

Speaking: Asking and answering general questions on familiar topics such as home, family, work, studies and interests. Self introductions and introducing others.

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.

Pronunciation: Vowels, Consonants, Plural markers and their realizations

Unit 2:

Lesson-1: Nehru's letter to his daughter Indira on her birthday from "**Infotech English**", Maruthi Publications

Lesson-2: Bosom Friend by Hira Bansode from "**The Individual Society",** Pearson Publications.(Non-detailed)

Listening: Answering a series of questions about main idea and supporting ideas after listening to audio texts, both in speaking and writing.

Speaking: Discussion in pairs/ small groups on specific topics followed by short structured talks. Functional English: Greetings and leave takings.**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)

Grammar: Use of articles and zero article; prepositions.

Pronunciation: Past tense markers, word stress-di-syllabic words

Unit 3:

Lesson-1: Stephen Hawking-Positivity 'Benchmark' from "**Infotech English**", Maruthi Publications

Lesson-2: Shakespeare's Sister by Virginia Woolf from "**The Individual Society",** Pearson Publications.(Non-detailed**)**

Listening: Listening for global comprehension and summarizing what is listened to, both in speaking and writing.

Speaking: Discussing specific topics in pairs or small groups and reporting what is discussed.Functional English:Complaining and Apologizing.

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.

Reading for Writing: Summarizing - identifying main idea/s and rephrasing what is read; avoiding redundancies and repetitions. Letter writing-types, format and principles of letter writing.E-mail etiquette, Writing CV's.

Vocabulary: Technical vocabulary from across technical branches (20 words). GRE Vocabulary (20 words) (Antonyms and Synonyms, Word applications) Association, sequencing of words

Grammar: Verbs - tenses; subject-verb agreement; direct and indirect speech, reporting verbs for academic purposes.

Pronunciation: word stress-poly-syllabic words.

Unit 4:

Lesson-1: Liking a Tree, Unbowed: Wangari Maathai-biography from "**Infotech English**", Maruthi Publications

Lesson-2: Telephone Conversation-Wole Soyinka from "**The Individual Society",** Pearson Publications**.**(Non-detailed)

Listening: Making predictions while listening to conversations/ transactional dialogues without video (only audio); listening to audio-visual texts.

Speaking: Role plays for practice of conversational English in academic contexts (formal and informal) - asking for and giving information/directions.Functional English: Permissions, Requesting, Inviting.

Reading: Studying the use of graphic elements in texts to convey information, reveal trends/patterns/relationships, communicative process or display complicated data.

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.

Vocabulary: Technical vocabulary from across technical branches (20 words) GRE Vocabulary (20 words) (Antonyms and Synonyms, Word applications) Cloze Encounters.

Grammar: Quantifying expressions - adjectives and adverbs; comparing and contrasting; degrees of comparison; use of antonyms

Pronunciation: Contrastive Stress

Unit 5:

Lesson-1: Stay Hungry-Stay foolish from "**Infotech English**", Maruthi Publications

Lesson-2: Still I Rise by Maya Angelou from "**The Individual Society",** Pearson Publications.(Non-detailed)

Listening: Identifying key terms, understanding concepts and interpreting the concepts both in speaking and writing.

Speaking: Formal oral presentations on topics from academic contexts - without the use of PPT slides.Functional English: Suggesting/Opinion giving.

Reading: Reading for comprehension. RAP StrategyIntensive reading and Extensive reading techniques.

Reading for Writing: Writing academic proposals- writing research articles: format and style.

Vocabulary: Technical vocabulary from across technical branches (20 words) GRE Vocabulary (20 words) (Antonyms and Synonyms, Word applications) Coherence, matching emotions.

Grammar: Editing short texts – identifying and correcting common errors in grammar and usage (articles, prepositions, tenses, subject verb agreement)

Pronunciation: Stress in compound words

Prescribed text books for theory for Semester-I:

1. "**Infotech English**", Maruthi Publications. (Detailed)

2. "**The Individual Society",** Pearson Publications.(Non-detailed)

Prescribed text book for Laboratory for Semesters-I & II:

1. "**Infotech English**", Maruthi Publications. (with Compact Disc)

Reference Books:

- Bailey, Stephen. *Academic writing: A handbook for international students*. Routledge, 2014.
- Chase, Becky Tarver. *Pathways: Listening, Speaking and Critical Thinking.* Heinley ELT; 2nd Edition, 2018.
- Skillful Level 2 Reading & Writing Student's Book Pack (B1) Macmillan Educational.
- Hewings, Martin. *Cambridge Academic English (B2)*. CUP, 2012.

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I Year - I Semester		L	T	P	C
		3	0	0	3
ENGINEERING PHYSICS (BSC1102) **(For All Non-Circuital Branches like ME, CE, Chemical etc.)**					

COURSE OBJECTIVES

1. Bridging the gap between the physics in school at 10+2 level and UG level engineering courses.
2. To identify the importance of the optical phenomenon i.e. interference, diffraction and polarization related to its Engineering applications
3. Understand the mechanism for emission of light, utility of lasers as coherent light sources for low and high energy applications, study of propagation of light through optical fibers and their implications in optical communications.
4. Open new avenues of utility for dielectric and magnetic materials as potential sources for micro devices.
5. Familiarize the concepts of theoretical acoustics for their practical utility in engineering acoustics. Explanation for the significance of ultrasound and its application in NDT application.
6. Enlighten the periodic arrangement of atoms in Crystalline solids by Bragg's law – Learning the structural analysis through X-ray diffraction.

COURSE OUTCOMES

1. **Explain** the need of coherent sources and the conditions for sustained interference (L2). **Identify** applications of interference in engineering (L3). **Analyze** the differences between interference and diffraction with applications (L4). **Illustrate** the concept of polarization of light and its applications (L2). **Classify** ordinary polarized light and extraordinary polarized light (L2) The different realms of physics and their applications in both scientific and technological systems are achieved through the study of wave optics.
2. **Explain** various types of emission of radiation (L2). **Identify** lasers as tools in engineering applications (L3). **Describe** the construction and working principles of various types of lasers (L1). **Explain** the working principle of optical fibers (L2). **Classify the** optical fibers based on refractive index profiles and modes of propagation (L2). **Identify** the applications of optical fibers in medical, communication and other fields (L2). **Apply** the fiber optic concepts in various fields (L3).
3. **Explain** the concept of dielectric constant and polarization in dielectric materials (L2). **Summarize** various types of polarization of dielectrics (L2). **Interpret** Lorentz field and Claussius- Mosotti relation in dielectrics (L2). **Classify** the magnetic materials based on susceptibility and their temperature dependence (L2). **Explain** the applications of dielectric and magnetic materials (L2). **Apply** the concept of magnetism to magnetic devices (L3).
4. **Explain** sound waves and its propagation/absorption of construction material used in design of buildings (L2). **Analyze** acoustic parameters of typical materials used in buildings (L4). **Recognize** sound level disruptors and their application in architectural acoustics (L2). **Identify** the use of ultrasonics in diversified fields of engineering (L3)
5. **Interpret** various crystal systems (L2) and **Analyze** the characterization of materials by XRD (L4). **Identify** the important properties of crystals like the presence of long-range order and periodicity, structure determination using X-ray diffraction technique (L3). **Analysis** of structure of the crystals by Laue and Powder techniques (L2)

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Unit-I: Wave Optics **12hrs**

Interference: Principle of superposition –Interference of light - Interference in thin films (Reflection Geometry) & applications -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) – Grating - Dispersive power and resolving power of Grating(Qualitative).

Polarization: Introduction-Types of polarization - Polarization by reflection, refraction and Double refraction - Nicol's Prism -Half wave and Quarter wave plates.

Unit Outcomes:

The students will be able to

- **Explain** the need of coherent sources and the conditions for sustained interference (L2)
- **Identify** engineering applications of interference (L3)
- **Analyze** the differences between interference and diffraction with applications (L4)
- **Illustrate** the concept of polarization of light and its applications (L2)
- **Classify** ordinary polarized light and extraordinary polarized light (L2)

Unit-II: Lasers and Fiber optics **10hrs**

Lasers: Introduction – Characteristics of laser – Spontaneous and Stimulated emissions of radiation – Einstein's coefficients – Population inversion –Lasing action- Pumping mechanisms – 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 Outcomes:

The students will be able to

- **Understand** the basic concepts of LASER light Sources (L2)
- **Apply** the concepts to learn the types of lasers (L3)
- **Identifies** the Engineering applications of lasers (L2)
- **Explain** the working principle of optical fibers (L2)
- **Classify** optical fibers based on refractive index profile and mode of propagation (L2)
- **Identify** the applications of optical fibers in various fields (L2)

UNIT III: Engineering Materials **8hrs**

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- Piezoelectricity.

Magnetic Materials: Introduction - Magnetic dipole moment - Magnetization-Magnetic susceptibility and permeability - Origin of permanent magnetic moment - Classification of magnetic materials: Dia, para, Ferro, antiferro & Ferrimagnetic materials - Domain concept for Ferromagnetism & Domain walls (Qualitative) - Hysteresis - soft and hard magnetic materials- Eddy currents- Engineering applications.

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Unit Outcomes:

The students will be able to

- **Explain** the concept of dielectric constant and polarization in dielectric materials (L2)
- **Summarize** various types of polarization of dielectrics (L2)
- **Interpret** Lorentz field and Claussius- Mosotti relation in dielectrics(L2)
- **Classify** the magnetic materials based on susceptibility and their temperature dependence (L2)
- **Explain** the applications of dielectric and magnetic materials (L2)
- **Apply** the concept of magnetism to magnetic devices (L3)

Unit-IV: Acoustics and Ultrasonics **10hrs**

Acoustics: Introduction – requirements of acoustically good hall– Reverberation – Reverberation time– Sabine's formula (Derivation using growth and decay method) - Absorption coefficient and its determination – Factors affecting acoustics of buildings and their remedial measures.

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

Unit Outcomes:

The students will be able to

- **Explain** how sound is propagated in buildings (L2)
- **Analyze** acoustic properties of typically used materials in buildings (L4)
- **Recognize** sound level disruptors and their use in architectural acoustics (L2)
- **Identify** the use of ultrasonics in different fields (L3)

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.

Unit Outcomes:

The students will be able to

- **Classify** various crystal systems (L2)
- **Identify** different planes in the crystal structure (L3)
- **Analyze** the crystalline structure by Bragg's X-ray diffractometer (L4)
- **Apply** powder method to measure the crystallinity of a solid (L4)

Text books:

1. Engineering Physics – Dr. M.N. Avadhanulu & Dr. P.G. Kshirsagar, S. Chand and Company
2. Engineering physics – D.K. Battacharya and Poonam Tandon, Oxford University press.
3. Engineering Physics by P.K.Palanisamy SciTech publications.

Reference Books:

1. Fundamentals of Physics – Halliday, Resnick and Walker, John Wiley &Sons
2. Engineering Physics – M.R.Srinivasan, New Age Publications
3. Engineering Physics – D K Pandey, S. Chaturvedi, Cengage Learning
4. Engineering Physics - Sanjay D. Jain, D. Sahasrambudhe and Girish, University Press

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I Year - I Semester		L	T	P	C
		1	0	4	3
ENGINEERING DRAWING (ESC1101)					

Course Objective: Engineering drawing being the principal method of communication for engineers, the objective is to introduce the students, the techniques of constructing the various types of polygons, curves and scales. The objective is also to visualize and represent the 3D objects in 2D planes with proper dimensioning, scaling etc.

Unit I
Objective: To introduce the students to use drawing instruments and to draw polygons, Engg. Curves.
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
Objective: To introduce the students to use orthographic projections, projections of points & simple lines. To make the students draw the projections of the lines inclined to both the planes.
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 and traces.

Unit III
Objective: The objective is to make the students draw the projections of the plane inclined toboth the planes.
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
Objective: The objective is to make the students draw the projections of the various types of solids in different positions inclined to one of the planes.
Projections of Solids – Prisms, Pyramids, Cones and Cylinders with the axis inclined to both the planes.

Unit V
Objective: The objective is to represent the object in 3D view through isometric views. The student will be able to represent and convert the isometric view to orthographic view and vice versa.

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

Course Outcome: The student will learn how to visualize 2D & 3D objects.

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I Year - I Semester		L	T	P	C
		2	0	2	3
ENGINEERING GEOLOGY **Integrated (Theory & Lab) (ESC1102)**					

Course Learning Objectives:
The objective of this course is:

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

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

- Identify and classify the geological minerals
- Measure the rock strengths of various rocks
- Classify and measure the earthquake prone areas to practice the hazard zonation
- Classify, monitor and measure the Landslides and subsidence
- Prepares, analyses and interpret the Engineering Geologic maps
- Analyses the ground conditions through geophysical surveys.
- Test the geological material and ground to check the suitability of civil engineering project construction.
- Investigate the project site for mega/mini civil engineering projects. Site selection for mega engineering projects like Dams, Tunnels, disposal sites etc.

UNIT-I:
Introduction: 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.

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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 Tunnelling, effects, Lining of Tunnels. Influence of Geology for successful Tunnelling.

TEXT BOOKS:

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

REFERENCES:

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.

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ENGINEERING GEOLOGY LAB

Syllabus

Course Learning Objectives:
The objective of this course is:

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

- Identify Megascopic minerals & their properties.
- Identify Megascopic rocks & their properties.
- Identify the site parameters such as contour, slope & aspect for topography.
- Know the occurrence of materials using the strike & dip problems.

SYLLABUS:

LIST OF EXPERIMENTS

1. Physical properties of minerals: Mega-scopic identification of
   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.
   a) Igneous rocks – Types of Granite, Pegmatite, Gabbro, Dolerite, Syenite, Granite Poryphery, Basalt, etc.
   b) Sedimentary rocks – Sand stone, Ferrugineous 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.

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LAB EXAMINATION PATTERN:

1. Description and identification of FOUR minerals
2. Description and identification of FOUR (including igneous, sedimentary and metamorphic rocks)
3. ONE Question on Interpretation of a Geological map along with a geological section.
4. TWO Questions on Simple strike and Dip problems.
5. Bore hole problems.
6. Project report on geology.

REFERENCES:

1. 'Applied Engineering Geology Practicals' by M T Mauthesha Reddy, New Age International Publishers, 2nd Edition.
2. 'Foundations of Engineering Geology' by Tony Waltham, Spon Press, 3rd edition, 2009.

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I Year - I Semester		L	T	P	C
		0	0	3	1.5
ENGLISH COMMUNCATION SKILLS LAB (HSMC1102**)**					

TOPICS

UNIT I:

Vowels, Consonants, Pronunciation, Phonetic Transcription, Common Errors in Pronunciation,

UNIT II:

Word stress-di-syllabic words, poly-syllabic words, weak and strong forms, contrastive stress (Homographs)

UNIT III:

Stress in compound words,rhythm, intonation,accent neutralisation.

UNIT IV:

Listening to short audio texts and identifying the context and specific pieces of information toanswer a series of questions in speaking.

UNIT V:

Newspapers reading;Understanding and identifying key terms and structures useful for writing reports.

Prescribed text book: "**Infotech English**", Maruthi Publications.

References:

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.

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I Year - I Semester		L	T	P	C
		0	0	3	1.5
ENGINEERING PHYSICS LAB (BSC1103) **(For All Non-Circuital Branches like ME, CE, Chemical etc)**					

(Any 10 of the following listed experiments)

List of Engineering Physics Experiments

1. Laser: Determination of wavelength using diffraction grating.
1. Young's modulus of given material by Strain gauge method.
2. Study of variation of magnetic field along the axis of a current carrying circular coil by Stewart & Gee's method.
3. Determination of ultrasonic velocity in given liquid (Acoustic grating).
4. Determination of dielectric constant using charging and discharging method.
5. Study the variation of B versus H by magnetizing the magnetic material (B-H curve).
6. Estimation of Planck's constant using photoelectric effect.
7. Rigidity modulus of material of a wire-dynamic method (Torsional pendulum).
8. Determination of numerical aperture and acceptance angle of an optical fiber.
9. Determination of thickness of thin object by wedge method.
10. Determination of radius of curvature of given plano convex lens by Newton's rings.
11. Determination of wavelengths of different spectral lines in mercury spectrum using diffraction grating in normal incidence configuration.
12. Determination of dispersive power of the prism.
13. Sonometer: Verification of laws of string.
14. Measurement of magnetic susceptibility by Kundt's tube method.

References:

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

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I Year - I Semester		L	T	P	C
		0	0	3	1.5
BASICS OF CIVIL ENGG. (WORK SHOP) LAB (ESC1103**)**					

COURSE OBJECTIVES:

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

COURSE OUTCOMES:

Learners at the end of this Laboratory course will be able to

- ❖ Identify various components of a building and give lump-sum estimate.
- ❖ Determine distances and irregular areas using conventional survey instruments like chain, tape, cross-staff and compass
- ❖ Identify different soils
- ❖ Know various traffic signs & signals
- ❖ Determine centre of gravity and moment of inertia of channel and I-sections.
- ❖ 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
- ❖ Know to the process of making cement mortar / concrete for nominal mix

LIST OF EXPERIMENTS

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

REFERENCE BOOKS

1. Laboratory Manual for Basic Civil Engineering workshops

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DEPARTMENT OF CIVIL ENGINEERING

I Year - II Semester		L	T	P	C
		3	0	0	3
MATHEMATICS –II (LINER ALGEBRA & NUMERICAL METHODS)					

Course Objectives:

- 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: At the end of the course, the 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 Jordan, Gauss Seidel (L3)
- evaluate the approximate roots of polynomial and transcendental equations by different algorithms (L5)
- apply Newton's forward & backward interpolation and Lagrange's formulae for equal and unequal intervals (L3)
- apply numerical integral techniques to different Engineering problems (L3)
- apply different algorithms for approximating the solutions of ordinary differential equations with initial conditions to its analytical computations (L3)

UNIT – I: Solving systems of linear equations, Eigen values and Eigen vectors: (10 hrs)
Rank of a matrix by echelon form and normal form – Solving system of homogeneous and non-homogeneous linear equations – Gauss Elimination method – Eigenvalues and Eigen vectors and properties (article-2.14 in text book-1).

Unit – II: Cayley–Hamilton theorem and Quadratic forms: (10 hrs)
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. Singular values of a matrix, singular value decomposition (text book-3).

UNIT – III: Iterative methods: (8 hrs)
Introduction – Bisection method – Secant method – Method of false position – Iteration method – Newton-Raphson method (One variable and simultaneous Equations) – 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 – Newton's divide difference formula.

UNIT – V: Numerical differentiation and integration, Solution of ordinary differential equations with initial conditions: (10 hrs)

Numerical differentiation using interpolating polynomial – 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 –Runge-Kutta method (second and fourth order).

Text Books:

1. **B. S. Grewal,** Higher Engineering Mathematics, 44^{th} Edition, Khanna Publishers.
2. **B. V. Ramana,**Higher Engineering Mathematics, 2007 Edition, Tata Mc. Graw Hill Education.
3. **David Poole,** Linear Algebra- A modern introduction, 4^{th} Edition, Cengage.

Reference Books:

1. **Steven C. Chapra,** Applied Numerical Methods with MATLAB for Engineering and Science,Tata Mc. Graw Hill Education.
2. **M. K. Jain, S. R. K. Iyengar and R. K. Jain,** Numerical Methods for Scientific and Engineering Computation, New Age International Publications.
3. **Lawrence Turyn,** Advanced Engineering Mathematics, CRC Press.

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I Year - II Semester		L	T	P	C
		3	0	0	3
ENGINEERING CHEMISTRY (BS1202) ((Non-circuit branches)					

Knowledge of basic concepts of Chemistry for Engineering students will help them as professional engineers later in design and material selection, as well as utilizing the available resources.

COURSE OBJECTIVES

- ***Importance*** of usage of plastics in household appliances and composites (FRP) in aerospace and automotive industries.
- ***Outline*** the basics for the construction of electrochemical cells, batteries and fuel cells. Understand the mechanism of corrosion and how it can be prevented.
- ***Express*** the increases in demand as wide variety of advanced materials are introduced; which have excellent engineering properties.
  Classify and discuss the materials used in major industries like steel industry, metallurgical industries and construction industries and electrical equipment manufacturing industries. Lubrication is also ***summarized***.
- ***Relate*** the need of fuels as a source of energy to any industry, particularly industries like thermal power stations, steel industry, fertilizer industry etc., and hence introduced.
- ***Explain*** the importance and usage of water as basic material in almost all the industries; ***interpret*** drawbacks of steam boilers and also how portable water is supplied for drinking purposes.

UNIT I: POLYMER TECHNOLOGY **8 hrs**

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

Plastics: Compounding, fabrication (compression, injection, blown film and extrusion), preparation, properties and applications (PVC, polycarbonates and Bakelite), mention some examples of plastic materials used in electronic gadgets, recycling of e-plastic waste (waste to wealth).

Elastomers:- Introduction, preparation, properties and applications (Buna S, thiokol and polyurethanes).

Composite materials: Fiber reinforced plastics, conducting polymers, biodegradable polymers, biopolymers, biomedical polymers.

Course Outcomes: ***At the end of this unit, the students will be able to***

- ***Analyze*** the different types of composite plastic materials and ***interpret*** the mechanism of conduction in conducting polymers.

UNIT II: ELECTROCHEMICAL CELLS AND CORROSION **10 hrs**

Single electrode potential, electrochemical series and uses of series, standard hydrogen electrode, calomel electrode, construction of glass electrode, batteries (Dry cell, Li ion battery and zinc air cells), fuel cells (H_2-O_2, CH_3OH-O_2, phosphoric acid and molten carbonate).

Corrosion:-Definition, theories of corrosion (chemical and electrochemical), galvanic corrosion, differential aeration corrosion, stress corrosion, galvanic series, factors influencing rate of corrosion, corrosion control (proper designing and cathodic protection), Protective coatings (surface preparation, cathodic coatings, anodic coatings, electroplating and electroless plating [nickel]), Paints (constituents, functions and special paints).

Course Outcomes: ***At the end of this unit, the students will be able to***

- ***Utilize*** the theory of construction of electrodes, batteries and fuel cells in redesigning new engineering products and c***ategorize*** the reasons for corrosion and study methods to control corrosion.

UNIT III: CHEMISTRY OF MATERIALS **10 hrs**

Part- A:

Nano materials:- Introduction, sol-gel method, characterization by (Brunauer Emmet Teller [BET]), (scanning electron microscopy [SEM]) and (transmission electron microscopy [TEM]) with example (TiO_2), applications of graphene and fullerenes, carbon nanotubes (types, preparation and applications)

Thermal analysis techniques: Instrumentation and applications of thermogravimetric analysis (TGA), differential thermal analysis (DTA), differential scanning calorimetry (DSC).

Part-B:

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.

Course Outcomes: ***At the end of this unit, the students will be able to***

- ***Synthesize*** nanomaterials for modern advances of engineering technology.
- ***Summarize*** the techniques that detect and measure changes of state of reaction.
- ***Illustrate*** the commonly used industrial materials.

UNIT IV: FUELS **10 hrs**

Introduction, calorific value, higher calorific value, lower calorific values, problems using Dulong's formula, proximate and ultimate analysis of coal sample and their significance, numerical problems, petroleum (refining-cracking), synthetic petrol (Fischer Tropsch and Bergius), petrol knocking, diesel knocking, octane and cetane ratings, anti-knocking agents, Introduction to alternative fuels (Bio-diesel, ethanol, methanol, natural gas, liquefied petroleum gas, compressed natural gas), Flue gas analysis by Orsat apparatus, rocket fuels.

Course Outcomes: ***At the end of this unit, the students will be able to***

- ***Differentiate*** petroleum, petrol, synthetic petrol and have knowledge how they are produced.
- ***Study*** alternate fuels and a***nalyse*** flue gases.

UNIT V: WATER TECHNOLOGY **8 hrs**

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 related sums, ion exchange process), treatment of industrial waste water, potable water and its specifications, steps involved in purification of water, chlorination, break point chlorination-desalination (reverse osmosis and electro dialysis).

Course Outcomes: ***At the end of this unit, the students will be able to***

- ***Analyze*** the suitable methods for purification and treatment of hard water and brackish water.

Standard Books:

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 Publicating Co. (Latest edition).

Reference:

1. K. Sesha Maheshwaramma and Mridula Chugh, "**Engineering Chemistry**", Pearson India Edn.
2. O.G. Palana, "**Engineering Chemistry**", Tata McGraw Hill Education Private Limited, (2009).
3. CNR Rao and JM Honig (Eds) "**Preparation and characterization of materials**" Academic press, New York (latest edition)
4. B. S. Murthy, P. Shankar and others, "**Textbook of Nanoscience and Nanotechnology**", University press (latest edition)

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India
DEPARTMENT OF CIVIL ENGINEERING

I Year - II Semester		L	T	P	C
		3	0	0	3
ENIGINEERING MECHANICS (ESC1201)					

Objectives: The students completing this course are expected to understand the concepts of forces and its resolution in different planes ,resultant of force system, Forces acting on a body, their free body diagrams using graphical methods. They are required to understand the concepts of centre of gravity and moments of inertia and their application, Analysis of frames and trusses, different types of motion, friction and application of work - energy method.

- The students are to be exposed to the concepts of force and friction , direction and its application.
- The students are to be exposed to application of free body diagrams. Solution to problems using graphical methods and law of triangle of forces.
- The students are to be exposed to concepts of centre of gravity
- The students are to be exposed to concepts of moment of inertia and polar moment of inertia including transfer methods and their applications.
- 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.
- The students are to be exposed to concepts of work, energy and particle motion

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.

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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–Componentsofmotion– 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., 4thEdn , Mc Graw Hill publications.
2. Engineering Mechanics statics and dynamics – R.C.Hibbeler, 11thEdn – Pearson Publ.

REFERENCES:

1. Engineering Mechanics, statics and Dynamics, J.L.Meriam, 6thEdn – Wiley India Pvt Ltd.
2. Engineering Mechanics: Statics and Dynamics 3rd edition, Andrew Pytel and JaanKiusalaas, Cengage Learning publishers.
3. Engineering Mechanics, dynamics, Bhavikatti S.S – NewAge International Publishers.
4. Engineering Mechanics, statics and dynamics – I.H. Shames, – PearsonPublications
5. Mechanics For Engineers, statics -F.P.Beer&E.R.Johnston – 5thEdn Mc Graw Hill Publ.
6. Mechanics For Engineers, dynamics - F.P.Beer&E.R.Johnston – 5thEdn McGraw Hill Publ.
7. Theory & Problems of engineering mechanics, statics & dynamics – E.W.Nelson, C.L.Best& W.G. McLean, 5thEdn – Schaum's outline series - Mc Graw Hill Publ.
8. Engineering Mechanics, Fedinand . L. Singer, Harper – Collins.
9. Engineering Mechanics statics and dynamics, A Nelson, Mc Graw Hill publications
10. Engineering Mechanics, Tayal. Umesh Publications.

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DEPARTMENT OF CIVIL ENGINEERING

I Year - II Semester		L	T	P	C
		3	0	0	3
PROGRAMMING FOR PROBLEM SOLVING USING C (ES1202)					

COURSE OBJECTIVES:

The objectives of Programming for Problem Solving Using C are

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

UNIT I

Introduction to Computers: Creating and running Programs, Computer Numbering System, Storing Integers, Storing Real Numbers

Introduction to the C Language: Background, C Programs, Identifiers, Types, Variable, Constants, Input/output, Programming Examples, Scope, Storage Classes and Type Qualifiers.

Structure of a C Program: Expressions Precedence and Associativity, Side Effects, Evaluating Expressions, Type Conversion Statements, Simple Programs, Command Line Arguments.

UNIT II

Bitwise Operators: Exact Size Integer Types, Logical Bitwise Operators, Shift Operators.

Selection & Making Decisions: Logical Data and Operators, Two Way Selection, Multiway Selection, More Standard Functions

Repetition: Concept of Loop, Pretest and Post-test Loops, Initialization and Updating, Event and Counter Controlled Loops, Loops in C, Other Statements Related to Looping, Looping Applications, Programming Examples

UNIT III

Arrays: Concepts, Using Array in C, Array Application,Two Dimensional Arrays,Multidimensional Arrays, Programming Example – Calculate Averages

Strings: String Concepts, C String, String Input / Output Functions, Arrays of Strings, String Manipulation Functions String/ Data Conversion, A Programming Example – Morse Code

Enumerated, Structure, and Union: The Type Definition (Type def), Enumerated Types, Structure, Unions, and Programming Application

UNIT IV

Pointers: Introduction, Pointers to pointers, Compatibility, L value and R value

Pointer Applications: Arrays, and Pointers, Pointer Arithmetic and Arrays, Memory Allocation Function, Array of Pointers, Programming Application

Processor Commands: Processor Commands

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UNIT V

Functions: Designing, Structured Programs, Function in C, User Defined Functions, Inter-Function Communication, Standard Functions, Passing Array to Functions, Passing Pointers toFunctions, Recursion

Text Input / Output: Files, Streams, Standard Library Input / Output Functions, Formatting Input / Output Functions, Character Input / Output Functions

Binary Input / Output: Text versus Binary Streams, Standard Library, Functions for Files, Converting File Type.

TEXT BOOKS:

1. Programming for Problem Solving, Behrouz A. Forouzan, Richard F.Gilberg, CENGAGE
2. The C Programming Language, Brian W.Kernighan, Dennis M. Ritchie, 2e, Pearson

REFERENCES:

1. Computer Fundamentals and Programming, Sumithabha Das, Mc Graw Hill
2. Programming in C, Ashok N. Kamthane, AmitKamthane, Pearson
3. Computer Fundamentals and Programming in C, PradipDey, Manas Ghosh, OXFORD

COURSE OUTCOMES:

Upon the completion of the course the student will learn

1) To write algorithms and to draw flowcharts for solving problems
2) To convert flowcharts/algorithms to C Programs, compile and debug programs
3) To use different operators, data types and write programs that use two-way/ multi-way selection
4) To select the best loop construct for a given problem
5) To design and implement programs to analyze the different pointer applications
6) To decompose a problem into functions and to develop modular reusable code
7) To apply File I/O operations

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DEPARTMENT OF CIVIL ENGINEERING

I Year - I Semester		L	T	P	C
		3	0	0	3
BUILDING MATERIALS AND CONCRETE TECHNOLOGY (ESC1203)					

Aim and Objective of this course
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 and Hardened Concrete

Course Outcomes (COs)
1. Know various engineering properties of building construction materials and suggest their suitability
2. Identify the functional role of ingredients of concrete and apply this knowledge to concrete mix design
3. Acquire and apply fundamental knowledge in the fresh and hardened properties of concrete

Syllabus

Unit - I (Stones, Bricks, Tiles, Wood and Paints)
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 distempering, Constituents of paint – Types of paints – Painting of new and old wood – Varnish

Unit – II (Aggregates, Cement and Admixtures)
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

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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
3. "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

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DEPARTMENT OF CIVIL ENGINEERING

I Year - II Semester		L	T	P	C
		0	0	3	1.5
ENGINEERING CHEMISTRY LAB (BSC1203)					

Introduction to Chemistry laboratory – Molarity, normality, primary, secondary standard solutions, volumetric titrations, quantitative analysis

1. Determination of HCl using standard Na_2CO_3 solution.
2. Determination of alkalinity of a sample containing Na_2CO_3 and NaOH.
3. Determination of Mn^{+2} using standard oxalic acid solution.
4. Determination of ferrous iron using standard $K_2Cr_2O_7$ solution.
5. Determination of Cu^{+2} using standard hypo solution.
6. Determination of temporary and permanent hardness of water using standard EDTA solution.
7. Determination of Fe^{+3} by a colorimetric method.
8. Determination of the concentration of acetic acid using sodium hydroxide (pH-metry method).
9. Determination of iso-electric point of amino acids using pH-metry method/conductometric method.
10. Determination of the concentration of strong acid vs strong base (by conductometric method).
11. Determination of strong acid vs strong base (by potentiometric method).
12. Determination of Mg^{+2} present in an antacid.
13. Determination of $CaCO_3$ present in an egg shell.
14. Estimation of Vitamin C.
15. Determination of phosphoric content in soft drinks.
16. Adsorption of acetic acid by charcoal.
17. Preparation of nylon-6, 6 and Bakelite (demonstration only).

Of the above experiments at-least 10 assessment experiments should be completed in a semester.

Outcomes: The students entering into the professional course have practically very little exposure to lab classes. The experiments introduce volumetric analysis; redox titrations with different indicators; EDTA titrations; then they are exposed to a few instrumental methods of chemical analysis. Thus at the end of the lab course, the student is exposed to different methods of chemical analysis and use of some commonly employed instruments. They thus acquire some experimental skills.

Reference Books

1. A Textbook of Quantitative Analysis, Arthur J. Vogel.

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I Year - II Semester		L	T	P	C
		0	0	3	1.5
PROGRAMMING FOR PROBLEM SOLVING USING C LAB (ESC1204)					

Course Objectives:

1) Apply the principles of C language in problem solving.
2) To design flowcharts, algorithms and knowing how to debug programs.
3) To design & develop of C programs using arrays, strings pointers & functions.
4) To review the file operations, preprocessor commands.

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 ... 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.

Course Outcomes:

By the end of the Lab, the student

1) Gains Knowledge on various concepts of a C language.
2) Able to draw flowcharts and write algorithms.
3) Able design and development of C problem solving skills.
4) Able to design and develop modular programming skills.
5) Able to trace and debug a program

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I Year - II Semester		L	T	P	C
		0	0	3	1.5
BUILDING PLANNING AND COMPUTER AIDED BUILDING DRAWING (ESC1205)					

Aim and Objective of this course
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 (COs)
1. Perform basic commands of any suitable CAD software to draw 2D drawings
2. Interpret the conventions, signs and symbols from a given drawing.
3. Prepare line plans of residential and public buildings using principles of planning.
4. Prepare submission and working drawing from the given requirement for Load Bearing and Framed structures

Major Equipment/ Instruments / System required
1. Computer with specification suitable for relevant CAD software with any suitable CAD Software
2. Laser Printer preferably for the output of A3 size.

Week 1, 2 and 3

Concepts to be studied
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)

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Week 4, 5 and 6

Concepts to be studied

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 Hail and Library.

Week 7, 8, 9 and 10

Concepts to be studied

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

Concepts to be studied

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 7

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

Exercise 8

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

Note: It is mandatory that student performs all 9 Exercises (from 0 to 8).

SUGGESTED STUDENT ACTIVITIES

1. Prepare report on Provisions given in National Building Code 2005.
2. Collect and study building Bye laws, rules and regulation for planning as per local competent authority.
3. Prepare list of the documents required for obtaining permission for construction of residential building/apartment from competent authority and write report.
4. Prepare list of the documents required for obtaining permission for construction of commercial building from competent authority and write report.
5. Prepare a model of a simple building using card board showing different components with suitable colour.

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I Year - II Semester		L	T	P	C
		2	0	0	0
ENVIRONMENTAL SCIENCE (MC1201)					

Learning 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.

UNIT-I:
Multidisciplinary nature of Environmental Studies: Definition, Scope and Importance – 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 - Ecological succession. - Food chains, food webs and ecological pyramids; Introduction, types, characteristic features, structure and function of Forest ecosystem, Grassland ecosystem, Desert ecosystem, Aquatic ecosystems.

UNIT-II:
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.
Food resources: World food problems, changes caused by non-agriculture activities-effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity.
Energy resources: Growing energy needs, renewable and non-renewable energy sources use of alternate energy sources.
Land resources: Land as a resource, land degradation, Wasteland reclamation, man induced landslides, soil erosion and desertification; Role of an individual in conservation of natural resources; Equitable use of resources for sustainable lifestyles.

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

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UNIT–IV:

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:

Social Issues and the Environment: Urban problems related to energy -Water conservation, rain water harvesting - Resettlement and rehabilitation of people; its problems and concerns. 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-Issues involved in enforcement of environmental legislation. -Public awareness.

Environmental Management: Impact Assessment and its significance various stages of EIA, preparation of EMP and EIS, Environmental audit. Ecotourism, Green Campus – Green business and Green politics.

The student should Visit an Industry / Ecosystem and submit a report individually on any issues related to Environmental Studies course and make a power point presentation.

Text Books:

1. Environmental Studies, K. V. S. G. Murali Krishna, VGS Publishers, Vijayawada
2. Environmental Studies, R. Rajagopalan, 2nd Edition, 2011, Oxford University Press.
3. Environmental Studies, P. N. Palanisamy, P. Manikandan, A. Geetha, and K. Manjula Rani; Pearson Education, Chennai

Reference:

1. Text Book of Environmental Studies, Deeshita Dave & P. UdayaBhaskar, Cengage Learning.
2. A Textbook of Environmental Studies, Shaashi Chawla, TMH, New Delhi
3. Environmental Studies, Benny Joseph, Tata McGraw Hill Co, New Delhi
4. Perspectives in Environment Studies, Anubha Kaushik, C P Kaushik, New Age International Publishers, 2014

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II Year - I Semester		L	T	P	C
		3	0	0	3
MATHEMATICS-III (Vector Calculus, Transforms and PDE) (BSC301) **(Common to ALL branches of Second Year B.Tech.)**					

Course Objectives:

- 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 applications.

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

- interpret the physical meaning of different operators such as gradient, curl and divergence (L5)
- estimate the work done against a field, circulation and flux using vector calculus (L5)
- apply the Laplace transform for solving differential equations (L3)
- find or compute the Fourier series of periodic signals (L3)
- know and be able to apply integral expressions for the forwards and inverse Fourier transform to a range of non-periodic waveforms (L3)
- identify solution methods for partial differential equations that model physical processes (L3)

UNIT –I: Vector calculus: (10 hrs)

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) and problems on above theorems.

UNIT –II: Laplace Transforms: (10 hrs)

Laplace transforms – Definition and Laplace transforms of some certain functions– Shifting theorems – Transforms of derivatives and integrals – Unit step function –Dirac's delta function Periodic function – 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: (10 hrs)

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 cosine transforms – Properties (article-22.5 in text book-1) – inverse transforms – Convolution theorem (without proof) – Finite Fourier transforms.

UNIT –IV: PDE of first order: **(8hrs)**

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 and Applications: (10 hrs)

Second order PDE: Solutions of linear partial differential equations with constant coefficients –Non-homogeneous term of the type e^{ax+by}, $\sin(ax+by)$, $\cos(ax+by)$, $x^m y^n$.

Applications of PDE: Method of separation of Variables– Solution of One-dimensional Wave, Heat and two-dimensional Laplace equation.

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. **Dean. G. Duffy,**Advanced Engineering Mathematics with MATLAB, 3rd Edition, CRC Press.
3. **Peter O' Neil,** Advanced Engineering Mathematics, Cengage.
4. **Srimantha Pal, S C Bhunia,** Engineering Mathematics, Oxford University Press.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India
DEPARTMENT OF CIVIL ENGINEERING

II Year - I Semester		L	T	P	C
		3	0	0	3
STRENGTH OF MATERIALS - I					

Course Learning Objectives:

- 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.
- To give concepts of stresses developed in the cross section and bending equations calculation of section modulus of sections with different cross sections
- The concepts above will be utilized in measuring deflections in beams under various loading and support conditions
- 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:

- The student will be able to understand the basic materials behavior under the influence of different external loading conditions and the support conditions
- The student will be able to draw the diagrams indicating the variation of the key performance features like bending moment and shear forces
- The student will have knowledge of bending concepts and calculation of section modulus and for determination of stresses developed in the beams and deflections due to various loading conditions
- The student will be able to assess stresses across section of the thin and thick cylinders to arrive at optimum sections to withstand the internal pressure using Lame's equation.

SYLLABUS:

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 like rectangular, 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, NewDelhi
2. Strength of materials by R. K. Bansal, Lakshmi Publications.

REFERENCES:

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.

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DEPARTMENT OF CIVIL ENGINEERING

II Year - I Semester		L	T	P	C
		3	0	0	3
FLUID MECHANICS					

Course Learning Objectives:

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

Course Outcomes:

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

- Understand the various properties of fluids and their influence on fluid motion and analyse a variety of problems in fluid statics and dynamics.
- Calculate the forces that act on submerged planes and curves.
- Ability to analyse various types of fluid flows.
- 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.
- Able Measure the quantities of fluid flowing in pipes, tanks and channels.

Syllabus:

UNIT I

Introduction: 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 – Center 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.

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

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

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DEPARTMENT OF CIVIL ENGINEERING

II Year - I Semester		L	T	P	C
		3	0	0	3
SURVEYING AND GEOMETRICS					

Course Objectives:
The object of the course student should have the capability to:

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

Course Outcomes:
Course will enable the student to:

- Apply the knowledge to calculate angles, distances and levels
- Identify data collection methods and prepare field notes
- Understand the working principles of survey instruments, measurement errors and corrective measures
- Interpret survey data and compute areas and volumes, levels by different type of equipment and relate the knowledge to the modern equipment and methodologies

SYLLABUS

UNIT - I
Introduction and 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 leveling when base is accessible and inaccessible.

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

UNIT - IV

Curves: Types of curves and their necessity, elements of simple, compound, reverse curves.
Tachometric Surveying: Principles of Tachometry, stadia and tangential methods of Tachometry,
Modern Surveying Methods: Principle and types of E.D.M. Instruments, Total station- advantages and Applications. Introduction to Global Positioning System.

UNIT - V

Photogrammetry Surveying:
Introduction, Basic concepts, perspective geometry of aerial photograph, relief and tilt displacements, terrestrial photogrammetry, flight planning; Stereoscopy, ground control extension for photographic mapping- aerial triangulation, radial triangulation, methods; photographic mapping- mapping using paper prints, mapping using stereoplotting instruments, mosaics, map substitutes.

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. Chandra A M, “Plane Surveying and highersurveying”, New Age International Pvt. Ltd., Publishers, New Delhi.
3. Duggal S K, “Surveying (Vol – 1 & 2), Tata McGraw Hill Publishing Co. Ltd. New Delhi.

REFERENCES:

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

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DEPARTMENT OF CIVIL ENGINEERING

II Year - I Semester		L	T	P	C
		3	0	0	3
HIGHWAY ENGINEERING					

Course Learning Objectives:
The objectives of this course are:

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

- Plan highway network for a given area.
- Determine Highway alignment and design highway geometrics.
- Design Intersections and prepare traffic management plans
- Judge suitability of pavement materials and design flexible and rigid pavements

SYLLABUS:

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.

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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.

REFERENCES:

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

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DEPARTMENT OF CIVIL ENGINEERING

II Year – I Semester		L	T	P	C
		0	0	3	1.5
CONCRETE TECHNOLOGY LAB					

Course Learning Objectives:

- To study basic properties ingredients of concrete, fresh and hardened concrete properties

Course Outcomes:

Upon successful completion of this course, student will be able to

- Determine consistency and fineness of cement.
- Determine setting times of cement.
- Determine specific gravity and soundness ofcement.
- Determine compressive strength ofcement.
- Determine workability of cement concrete by compaction factor, slump and Vee – Beetests
- Determine specific gravity of coarse aggregate and fine aggregate by Sieve analysis.
- Determine flakiness and elongation index ofaggregates.
- Determine bulking of sand.
- Understand non-destructive testing procedures on concrete.

List of Experiments: At least 10 experiments must be conducted (at least one for each property)

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-beetest.
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)

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List of Equipment:

1. Standard set of sieves for coarse aggregate and fine aggregate
2. Vicat's apparatus
3. Specific gravity bottle.
4. Lechatlier's apparatus.
5. Slump Test Apparatus.
6. Compaction Factor Test Apparatus.
7. Vee- Bee test apparatus
8. Longitudinal compresso-meter
9. Universal testing Machine (UTM)/Compression Testing Machine(CTM).
10. Rebound hammer, Ultrasonic pulse velocity machine, micro cover meteretc.

Reference:

1) Concrete Manual by M.L.Gambhir

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DEPARTMENT OF CIVIL ENGINEERING

II Year – I Semester		L	T	P	C
		0	0	3	1.5
HIGHWAY ENGINEERING LAB					

Course Learning Objectives:
The objectives of this course are:

1. 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.
2. To know penetration value, ductility value, softening point, flash and fire point, viscosity and stripping for the given bitumen grade.
3. To test the stability for the given bituminous mix
4. To carry out surveys for traffic volume, speed and parking.

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

a. Test aggregates and judge the suitability of materials for the road construction
b. Test the given bitumen samples and judge their suitability for the road construction
c. Obtain the optimum bitumen content for Bituminous Concrete
d. Determine the traffic volume, speed and parking characteristics.
e. Draw highway cross sections and intersections.

SYLLABUS:

I. ROAD AGGREGATES:

1. Aggregate Crushing value Test
2. Aggregate Impact Test.
3. Specific Gravity and Water Absorption Test
4. Attrition Test
5. Abrasion Test.
6. Shape tests

II. BITUMINOUS MATERIALS:

1. Penetration Test.
2. Ductility Test.
3. Softening Point Test.
4. Flash and fire point tests.
5. Stripping Test
6. Viscosity Test.

III. BITUMINOUS MIX:

1. Marshall Stability test.

IV. TRAFFIC SURVEYS:

1. Traffic volume study at mid blocks.
2. Traffic Volume Studies (Turning Movements) at intersection.
3. Spot speed studies.
4. Parking study.

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V. DESIGN & DRAWING

1. Earthwork calculations for road works
2. Drawing of road cross sections
3. Rotary intersection design

LIST OF EQUIPMENT:

1. Apparatus for aggregate crushing test.
2. Aggregate Impact testing machine
3. Pycnometers
4. Los angles Abrasion test machine
5. Deval's Attrition test machine
6. Elongation and thickness gauges
7. Bitumen penetration test setup.
8. Bitumen Ductility test setup.
9. Ring and ball apparatus
10. Viscometer.
11. Marshal Mix design apparatus.
12. Enoscope for spot speed measurement.
13. Stop Watches

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.

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DEPARTMENT OF CIVIL ENGINEERING

II Year - I Semester		L	T	P	C
		0	0	3	1.5
SURVEYING FILED WORK – I (Lab)					

List of Field Works:

1. Survey by chain survey of road profile with offsets in case of road widening.
2. Survey in an area by chain survey (Closed circuit)
3. Determination of distance between two inaccessible points by using compass.
4. Finding the area of the given boundary using compass (Closed Traverse)
5. Plane table survey; finding the area of a given boundary by the method of Radiation
6. Plane table survey; finding the area of a given boundary by the method of intersection.
7. Two Point Problem by the plane table survey.
8. Fly levelling : Height of the instrument method (differential levelling)
9. Fly levelling: rise and fall method.
10. Fly levelling: closed circuit/ open circuit.
11. Fly levelling; Longitudinal Section and Cross sections of a given road profile.
12. Fly levelling and Fly chaining (complete field work).

Note: Any 10 field work assignments must be completed.

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II Year - I Semester		L	T	P	C
		1	0	2	2
SKILL ORIENTED COURSE*					

Topographic Survey with contour map (Total station/ DGPS) or

Masonry 3' height with different bonds and different thickness

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II Year - I Semester		L	T	P	C
		2	0	0	0
CONSTITUTION OF INDIA (MC)					

Course Objectives:

- To Enable the student to understand the importance of constitution
- To understand the structure of executive, legislature and judiciary
- To understand philosophy of fundamental rights and duties
- 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.
- To understand the central and state relation financial and administrative.

UNIT-I

Introduction to 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.

Learning outcomes:

After completion of this unit student will

- Understand the concept of Indian constitution
- Apply the knowledge on directive principle of state policy
- Analyze the History, features of Indian constitution
- Evaluate Preamble Fundamental Rights and Duties

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, LokSabha, RajyaSabha, The Supreme Court and High Court: Powers and Functions;

Learning outcomes:-After completion of this unit student will

- Understand the structure of Indian government
- Differentiate between the state and central government
- Explain the role of President and Prime Minister
- Know the Structure of supreme court and High court

UNIT-III

State Government and its Administration Governor - Role and Position - CM and Council of ministers, State Secretariat: Organisation, Structure and Functions

Learning outcomes:-After completion of this unit student will

- Understand the structure of state government
- Analyze the role Governor and Chief Minister
- Explain the role of state Secretariat
- Differentiate between structure and functions of state secretariat

UNIT-IV

A.Local Administration - District's Administration Head - Role and Importance, Municipalities - Mayor and role of Elected Representative - CEO of Municipal Corporation PachayatiRaj: Functions

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PRI: ZilaPanchayat, Elected officials and their roles, CEO ZilaPanchayat: Block level Organizational Hierarchy - (Different departments), Village level - Role of Elected and Appointed officials - Importance of grass root democracy

Learning outcomes:-After completion of this unit student will

- Understand the local Administration
- Compare and contrast district administration role and importance
- Analyze the role of Myer and elected representatives of Municipalities
- Evaluate Zillapanchayat block level organisation

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

Learning outcomes:-After completion of this unit student will

- Know the role of Election Commission apply knowledge
- Contrast and compare the role of Chief Election commissioner and Commissiononerate
- Analyze role of state election commission
- Evaluate various commissions of viz SC/ST/OBC and women

References:

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
3. J.A. Siwach, Dynamics of Indian Government & Politics
4. D.C. Gupta, Indian Government and Politics
5. H.M.Sreevai, Constitutional Law of India, 4th edition in 3 volumes (Universal Law Publication)
6. J.C. Johari, Indian Government andPolitics Hans
7. J. Raj IndianGovernment and Politics
8. M.V. Pylee, Indian Constitution Durga Das Basu, Human Rights in Constitutional Law, Prentice – Hall of India Pvt. Ltd.. New Delhi
9. Noorani, A.G., (South Asia Human Rights Documentation Centre), Challenges to Civil Right), Challenges to Civil Rights Guarantees in India, Oxford University Press 2012

Resources:

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

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Course Outcomes:

At the end of the semester/course, the student will be able to have a clear knowledge on the following:

- Understand historical background of the constitution making and its importance for building a democratic India.
- Understand the functioning of three wings of the government ie., executive, legislative and judiciary.
- Understand the value of the fundamental rights and duties for becoming good citizen of India.
- Analyze the decentralization of power between central, state and local self-government.
- Apply the knowledge in strengthening of the constitutional institutions like CAG, Election Commission and UPSC for sustaining democracy.

1. Know the sources, features and principles of Indian Constitution.
2. Learn about Union Government, State government and its administration.
3. Get acquainted with Local administration and Pachayati Raj.
4. Be aware of basic concepts and developments of Human Rights.
5. Gain knowledge on roles and functioning of Election Commission

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II Year - II Semester		L	T	P	C
		3	0	0	3
COMPLEX VARIABLES AND STATISTICAL METHODS (Common to all branches of Second Year except CSE ant IT)					

Course Objectives:

- To familiarize the complex variables.
- To make the student capable of evaluating the integrals in complex domains
- To make the student capable of expanding a given function as a series and finding the poles and residues
- To make the student capable of evaluating the integrals in complex domains using residue theorem
- To familiarize the students with the foundations of probability and statistical methods.
- To equip the students to solve application problems in their disciplines.

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

- apply Cauchy-Riemann equations to complex functions in order to determine whether a given continuous function is analytic (L3)
- find the differentiation and integration of complex functions used in engineering problems (L5)
- make use of the Cauchy residue theorem to evaluate certain integrals (L3)
- apply discrete and continuous probability distributions (L3)
- design the components of a classical hypothesis test (L6)
- infer the statistical inferential methods based on small and large sampling tests (L4)

UNIT – I: Functions of a complex variable and Complex integration: (10 hrs)

Introduction – Continuity – Differentiability – Analyticity –Cauchy-Riemann equations in Cartesian and polar coordinates – Harmonicand conjugate harmonic functions – Milne – Thompson method. Complex integration: Line integral – Cauchy's integral theorem – Cauchy's integral formula – Generalized integral formula (all without proofs) and problems on above theorems.

UNIT – II:Series expansions and Residue Theorem: (10 hrs)

Radius of convergence – Expansion in Taylor's series, Maclaurin's series andLaurent series. Types of Singularities: Isolated – Essential –Pole of order m– Residues – Residue theorem (without proof) – Evaluation of real integral of the types $\int_{-\infty}^{\infty} f(x)dx$ and $\int_{c}^{c+2\pi} f(\cos\theta,\sin\theta)d\theta$.

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UNIT – III: Probability and Distributions: (10 hrs)

Review of probability and Baye's theorem – Random variables – Discrete and Continuous random variables – Distribution functions – Probability mass function, Probability density function and Cumulative distribution functions – Mathematical Expectation and Variance – Binomial, Poisson, Uniform and Normal distributions.

UNIT – IV: Sampling Theory: (8 hrs)

Introduction – Population and Samples – Sampling distribution of Means and Variance (definition only) – Central limit theorem (without proof) – Representation of the normal theory distributions – Introduction to t, χ^2 and F-distributions – Point and Interval estimations – Maximum error of estimate.

UNIT – V: Tests of Hypothesis: (10 hrs)

Introduction – Hypothesis – Null and Alternative Hypothesis – Type I and Type II errors – Level of significance – One tail and two-tail tests – Tests concerning one mean and two means (Large and Small samples) – Tests on proportions.

Text Books:

1. **B. S. Grewal,** Higher Engineering Mathematics, 44th Edition, Khanna Publishers.
2. **Miller and Freund's,** Probability and Statistics for Engineers,7/e, Pearson, 2008.

Reference Books:

1. **J. W. Brown and R. V. Churchill**, Complex Variables and Applications, 9th edition, Mc-Graw Hill, 2013.
2. **S.C. Gupta and V.K. Kapoor**, Fundamentals of Mathematical Statistics, 11/e, Sultan Chand & Sons Publications, 2012.
3. **Jay l. Devore,** Probability and Statistics for Engineering and the Sciences, 8th Edition,Cengage.
4. **Shron L.Myers, Keying Ye, Ronald E Walpole,** Probability and Statistics Engineers and the Scientists,8th Edition, Pearson 2007.
5. **Sheldon, M. Ross**, Introduction to probability and statistics Engineers and the Scientists, 4thEdition, Academic Foundation,2011

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II Year – II Semester		L	T	P	C
		3	0	0	3
STRENGTH OF MATERIALS - II					

Course Learning 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 this course,

- The student will be able to understand the basic concepts of Principal stresses developed in a member when it is subjected to stresses along different axes and design the sections.
- The student can assess stresses in different engineering applications like shafts, springs, columns and struts subjected to different loading conditions

SYLLABUS:

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.

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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.

REFERENCES:
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.

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II Year - II Semester		L	T	P	C
		3	0	0	3
HYDRAULICS AND HYDRAULIC MACHINERY					

Course Learning 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 this course the students will be able to:

- Solve uniform and non-uniform open channel flow problems.
- Apply the principals of dimensional analysis and similitude in hydraulic model testing.
- Understand the working principles of various hydraulic machineries and pumps.

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

UNIT II: 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 – III: 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 – IV: 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 – V:
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.

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.

References:

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 Higherducation.
4. Fluid mechanics and Hydraulic machines, R.K. Bansal, Laxmi publications ,New Delhi.

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II Year – II Semester		L	T	P	C
		3	0	0	3
ENVIRONMENTAL ENGINEERING					

Course Learning Objectives:
The course will address the following:

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

- Select a source based on quality and quantity and Estimate design population and water demand
- Design a water treatment plant for a village/city
- Design a sewer by estimating DWF and Strom water flow and plumbing system for buildings
- Design a Sewage Treatment Plant for a town/city.

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 deflouridation–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. Environmental Engineering – Howard S. Peavy, Donald R. Rowe, Teorge George Tchobanoglus – Mc-Graw-Hill Book Company, New Delhi, 1985.
2. Rural Municipal and Industrial water management, KVSG Murali Karishna, Environmental Protection Society, Kakinada, 2021.
3. Industrial Water and Wastewater Management, K.V.S.G. Murali Krishna, Paramount Publications, Visakhapatnam, 2018.
4. Elements of Environmental Engineering – K. N. Duggal, S. Chand & Company Ltd., New Delhi, 2012.

References

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.

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II Year - II Semester		L	T	P	C
		3	0	0	3
MANAGERIAL ECONOMICS AND FINANCIAL ANALYSIS (Common to all Branches)					

Course Learning Objectives:

- The Learning objectives of this paper are to understand the concept and nature of Managerial Economics and its relationship with other disciplines and also to understand the Concept of Demand and Demand forecasting.
- To familiarize about the Production function, Input Output relationship, Cost-Output relationship and Cost-Volume-Profit Analysis.
- To understand the nature of markets, Methods of Pricing in the different market structures and to know the different forms of Business organization and the concept of Business Cycles.
- To learn different Accounting Systems, preparation of Financial Statement and uses of different tools for performance evaluation.
- Finally, it is also to understand the concept of Capital, Capital Budgeting and the techniques used to evaluate Capital Budgeting proposals.

Course Outcomes:

- The Learner is equipped with the knowledge of estimating the Demand and demand elasticities for a product.
- The knowledge of understanding of the Input-Output-Cost relationships and estimation of the least cost combination of inputs.
- The pupil is also ready to understand the nature of different markets and Price Output determination under various market conditions and also to have the knowledge of different Business Units.
- The Learner is able to prepare Financial Statements and the usage of various Accounting tools for Analysis.
- The Learner can able to evaluate various investment project proposals with the help of capital budgeting techniques for decision making.

Unit-I

Introduction to Managerial Economics and demand Analysis:

Definition of Managerial Economics –Scope of Managerial Economics and its relationship with other subjects –Concept of Demand, Types of Demand, Determinants of Demand- Demand schedule, Demand curve, Law of Demand and its limitations- Elasticity of Demand, Types of Elasticity of Demand and Measurement- Demand forecasting and Methods of forecasting, Concept of Supply and Law of Supply.

Unit – II:
Theories of Production and Cost Analyses:
Theories of Production function- Law of Variable proportions-Isoquants and Isocosts and choice of least cost factor combination-Concepts of Returns to scale and Economies of scale-Different cost concepts: opportunity costs, explicit and implicit costs-Fixed costs, Variable Costs and Total costs –Cost –Volume-Profit analysis-Determination of Breakeven point(problems)-Managerial significance and limitations of Breakeven point.

Unit – III:
Introduction to Markets, Theories of the Firm & Pricing Policies:
Market Structures: Perfect Competition, Monopoly, Monopolistic competition and Oligopoly – Features – Price and Output Determination – Managerial Theories of firm: Marris and Williamson's models – other Methods of Pricing: Average cost pricing, Limit Pricing, Market Skimming Pricing, Internet Pricing: (Flat Rate Pricing, Usage sensitive pricing) and Priority Pricing, Business Cycles : Meaning and Features – Phases of a Business Cycle. Features and Evaluation of Sole Trader, Partnership, Joint Stock Company – State/Public Enterprises and their forms.

Unit – IV:
Introduction to Accounting & Financing Analysis:
Introduction to Double Entry System, Journal, Ledger, Trail Balance and Preparation of Final Accounts with adjustments – Preparation of Financial Statements-Analysis and Interpretation of Financial Statements-Ratio Analysis – Preparation of Funds flow and cash flow analysis (Problems)

Unit – V:
Capital and Capital Budgeting: Capital Budgeting: Meaning of Capital-Capitalization-Meaning of Capital Budgeting-Time value of money- Methods of appraising Project profitability: Traditional Methods(payback period, accounting rate of return) and modern methods(Discounted cash flow method, Net Present Value method, Internal Rate of Return Method and Profitability Index)

TEXT BOOKS:
1. R Aryasri, Managerial Economics and Financial Analysis, The McGraw – Hill companies.

REFERENCES:
1. Varshney R.L, K.L Maheswari, Managerial Economics, S. Chand & Company Ltd,
2. JL Pappas and EF Brigham, Managerial Economics, Holt, R & W; New edition edition
3. N.P Srinivasn and M. SakthivelMurugan, Accounting for Management, S. Chand & Company Ltd,
4. MaheswariS.N,AnIntroduction to Accountancy, Vikas Publishing House Pvt Ltd
5. I.M Pandey, Financial Management , Vikas Publishing House Pvt Ltd
6. V. Maheswari, Managerial Economics, S. Chand & Company Ltd,

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II Year – II Semester		L	T	P	C
		0	0	3	1.5
EVIRONMENTAL ENGINEERING LAB					

Course Learning Objectives:

The course will address the following:

- Estimation of important characteristics of water and wastewater in the laboratory
- Inference with reference to the significance of the characteristics of the water and wastewater

Course Outcomes:

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

- Estimate some important characteristics of water, wastewater and soil in the laboratory
- Draw some conclusion and decide whether the water is suitable for Drinking/Construction / Agriculture/ Industry.
- Estimate Chloride, EC and Salinity of Soil and suggest their suitability for Construction/Agriculture
- Estimation of the strength of the sewage in terms of BOD and COD and Decide whether the water body is polluted or not with reference to the stated parameters in the list of experiments
- Demonstration of various instruments used in testing of water and soil and study of Drinking water standards, WHO guidelines, Effluent standards and standards for Construction/ Agriculture/ Industry.

List of Experiments

1. Determination of pH and Electrical Conductivity (Salinity) of Water and Soil.
2. Determination and estimation of Total Hardness–Calcium &Magnesium in water.
3. Determination of P&M Alkalinity/Acidity
4. Determination of Chloride 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 Dissolved Oxygen with D.O. Meter &Wrinklers Method and BOD.
7. Physical parameters – Temperature, Color, Odor, Turbidity and Taste.
8. Determination of C.O.D.
9. Determination of Optimum coagulant dose- with and without coagulant aids
10. Determination of Chlorine residue and demand
11. Presumptive Coliform test.

12. Desalination by Freezing and Boiling.
13. EC, TDs and Chloride in RO System- Raw water, Product water and Reject.
14. Suitability of water for construction
15. Evaporation, Rainfall, Humidity, Wind speed, Wind Direction

NOTE: At-least 10 of the experiments enlisted are to be conducted. Values for different water and wastewater samples like Surface water, Ground water, Sea water, Municipal water, Bottled water, RO- Raw water, Product and Reject samples, Municipal sewage, Industrial waters etc

List of Equipment's

1) pH meter
2) Turbidity meter
3) Conductivity meter
4) Hot air oven
5) Muffle furnace
6) Dissolved Oxygen meter
7) U–V visible spectrophotometer
8) COD Reflux Apparatus
9) Jar Test Apparatus
10) BOD Incubator
11) Autoclave
12) Laminar flow chamber
13) Hazen's Apparatus
14) Chlorocsope
15) Weather Station

Text Books

1. Standard Methods for Analysis of Water and Waste Water –APHA
2. Chemical Analysis of Water and Soil by KVSG Murali Krishna, Environmental Protection Society, 4th Edition, 2021.

Reference

1. Relevant IS Codes.
2. Chemistry for Environmental Engineering by Sawyer and Mc.Carty.

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II Year – II Semester		L	T	P	C
		0	0	3	1.5
STRENGTH OF MATERIALS LAB					

Experiments

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. Sheartest (on UTM)
10. Verification of Maxwell's Reciprocal theorem on beams.
11. Use of Electrical resistance strain gauges
12. Continuous beam – deflection test.

List of Major Equipment:

1. Universal Testing Machine
2. Torsion testing machine
3. Brinnell's / Rock well's hardness testing machine
4. Setup for spring tests
5. Compression testing machine
6. Izod Impact machine
7. Shear testing machine
8. Beam setup for Maxwell's theorem verification.
9. Electrical Resistance gauges

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II Year – II Semester		L	T	P	C
		0	0	3	1.5
FLUID MECHANICS AND HYDRAULIC MACHINERY LAB					

List of Experiments

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.

List of Equipment:

1. Venturi meter setup.
2. Orifice meter setup.
3. Small orifice setup.
4. External mouth piece setup.
5. Rectangular and Triangular notch setups.
6. Friction factor test setup.
7. Bernoulli's theorem setup.
8. Impact of jets.
9. Hydraulic jump test setup.
10. Pelton wheel, Francis turbine and Kalpan turbines
11. Centrifugal and Reciprocating pumps.

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II Year - II Semester		L	T	P	C
		1	0	2	2
SKILL ORIENTED COURSE*					

Environmental Audit and compliance report or Road safety audit with 1 or 2 KM length or Water related leakage field studies

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III Year – I Semester	PROFESSIONAL CORE COURSE	L	T	P	C
		3	0	0	3
PC 501 STRUCTURAL ANALYSIS					

Course Learning Objectives:

- To give preliminary concepts of assessment of bending moment and shear force in Propped cantilevers, fixed beams and continuous beams - due to various loading conditions.
- To impart concepts of Bending Moment and Shear force for beams with different boundary and loading conditions.
- The procedure for development of slope deflection equations and to solve application to continuous beams with and without settlement of supports.
- The concepts of moving loads and influence lines are imparted for assessment of maximum SF and BM at a given section when loads of varying spans rolling loads of Pratt and Warren trusses.

Course Outcomes:

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

- Distinguish between the determinate and indeterminate structures.
- 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.
- Analyze the continuous beams using various methods -, three moment method, slope deflection method, energy theorems.
- Draw the influence line diagrams for various types of moving loads on beams/bridges.
- Analyze the loads in Pratt and Warren trusses when loads of different types and spans are passing over the truss.

Syllabus:

UNIT – I Propped Cantilever and Fixed beams

Propped Cantilevers: Introduction -Degree of Static and Kinematic indeterminacy of Beams, frames and trusses. Analysis of propped cantilevers-shear force and bending moment diagrams-Elastic curve - Deflection of propped cantilever beams.
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-Elastic curve - Deflection of fixed beams including effect of sinking of support, effect of rotation of a support.

UNIT – II Analysis of Continuous beams and Portal Frames

Slope-Deflection Method: Introduction, derivation of slope deflection equation, application to continuous beams with and without settlement of supports. Analysis of Single bay single storey portal frames without sway. Shear force and Bending moment diagrams, Elastic curve.

Moment distribution method: Application to continuous beams with and without settlement of supports. Analysis of Single bay single storey portal frames without sway. Shear force and Bending moment diagrams, Elastic curve.

UNIT III Analysis of Pin-Jointed Plane Frames: Determination of Forces in members of plane pin-jointed (determinate) perfect trusses by (i) method of joints (ii) method of sections and (iii) Method of Tension coefficients. Analysis of various types of cantilever and simply supported trusses by method of joints, method of sections and Tension coefficients.

UNIT – IV Moving Loads And Influence Lines: 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.
Definition of influence line for SF, Influence line for BM- load position for maximum SF at a section-Load position for maximum BM at a sections, single point load, U.D. load longer than the span, U.D. load shorter than the span- Influence lines for forces in members of Pratt and Warren trusses.

UNIT – V MATRIX METHODS OF ANALYSIS: Introduction to Flexibility and Stiffness matrix methods of analyses using 'system approach' up to three degree of indeterminacy– Analysis of continuous beams including settlement of supports using flexibility and stiffness methods - Analysis of pin-jointed determinate plane frames using flexibility and stiffness methods- Analysis of single bay single storey portal frames using only stiffness method - Shear force and bending moment diagrams - Elastic curve.

Text Books:

1. Structural Analysis by R.C. Hibbeler, Pearson, New Delhi.
2. Basic Structural Analysis, K U Muthu et. al., IK International Publishing house pvt. Ltd.

References

1. Indeterminate Structural Analysis, K U Muthu et. al., IK International Publishing house pvt. Ltd.
2. Analysis of Structures- Vol. I and II, V. N. Vazirani and M. M. Ratwani, Khanna
3. Publishers, New Delhi.
4. Mechanics of Structures Vol – II by H.J.Shah and S.B.Junnarkar, Charotar Publishing House Pvt. Ltd.
5. Structural Analysis by Devdas Menon, Narosa Publishing Housing Pvt. Ltd.
6. Structural Analysis: A Matrix Approach, G.S.Pandit and S.P.Gupta, Mc Graw Hill Pvt. Ltd.

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III Year – I Semester	PROFESSIONAL CORE COURSE	L	T	P	C
		3	0	0	3
PC502 DESIGN AND DRAWING OF REINFORCED CONCRETE STRUCTURES					

Course Learning Objectives:

The objective of this course is:

- Familiarize Students with different design philosophies
- Equip student with design of members in flexural and shear
- Understand bond and torsion
- Familiarize with design of compression members under different types of loading
- Understand different types of footings and design

Course Outcomes:

At the end of this course the student will be able to

- Work on different types of design methods
- Carryout analysis and design of flexural members and detailing
- Design structures subjected to shear, bond and torsion
- Design different type of compression members and footings

SYLLABUS:

UNIT –I Design Methods

Working stress method: Elastic theory: design constants, modular ratio, neutral axis depth and moment of resistance - balanced, under-reinforced and over-reinforced sections. Design of singly and doubly reinforced beams, IS Code Provisions.

Limit State Design: Basic statistical principles –Characteristic strength – Characteristic loads - Partial load and safety factors – stress-strain curves for HYSD bars and MS bars. Assumptions – stress block parameters – Moment of Resistance.

All units i.e. from unit II to unit V are to be taught in Limit State Design.

UNIT –II Design for Flexure and Shear: Design of singly reinforced beams- effective depth- Moment of Resistance- Doubly reinforced and flanged (T) beams- Minimum depth - Minimum and Maximum Flexural Tension Reinforcement - Design of Flanged Sections (T & L) - Effective width of flange - Analysis and Design Problems.

Design for Shear and Torsion: Analysis and design of sections for shear and torsion – bond, anchorage and development length, I.S. code provisions. Design examples in simply supported and continuous beams, detailing.

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UNIT – III Slabs and Serviceability: Classification of slabs, design of one - way slabs, one way continuous slab using IS Coefficients (Conventional) –Design of two - way slabs - simply supported slabs and slabs with various edge conditions using IS Coefficients. Design of Stair case **Limit state of serviceability:** Deflection, cracking and IS code provisions for beams and slabs.

UNIT – 1V Design of Compression members: Effective length, Braced and un-braced columns – IS Code provisions, Design of short and long columns under axial loads, uniaxial bending and biaxial bending (Demonstration using SP 16)

UNIT –V
Footings: Types of footings – Design of isolated footings – pedestal, square, rectangular and circular footings subjected to axial loads, uni-axial bending moment.

NOTE: All the designs to be taught in Limit State Method Following plates should be prepared by the students.

1. Reinforcement detailing of T-beams, L-beams and continuous beams.
2. Reinforcement detailing of columns and isolated footings.
3. Detailing of one-way, two-way and continuous slabs and waist-slab staircase.

FINAL EXAMINATION PATTERN:

The end examination paper should consist of Part A and Part B. Part A consists 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. Limit State Design, A. K.Jain, Nem Chand Brothers
2. Reinforced Concrete Structures, N. Krishna Raju & R. N. Pranesh, and New Age Publications.
3. Structural Design and Drawing by N.Krishna Raju, Universities Press

References:

1. R C C Design, B.C Punmia, A. K. Jain and A. K Jain. Lakshmi Publications
2. Reinforced Concrete Structures, S. Unnikrishna Pillai &Devdas Menon, Tata C.Graw Hill, New Delhi.
3. Design of Reinforced concrete Structures, N.Subrahmanian, and Oxford University Press.
4. Limit state design of reinforced concrete structures by P C Varghese, PHI Learning pvt. Ltd.

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III Year – I Semester	PROFESSIONAL CORE COURSE	L	T	P	C
		3	0	0	3
PC 503 GEOTECHNICAL ENGINEERING - I					

Course Learning Objectives:
The Objectives of this course are:

1. To enable the student to determine the index properties of the soil and classify it.
2. To impart the concept of seepage of water through soils and determine the discharge of water through soils.
3. To impart the principles of compaction and consolidation of soils and determine the magnitude and the rate of consolidation settlement.
4. To enable the student to understand the concept of shear strength of soils, determine the shear parameters of sands and clays and the areas of their application.

Course Outcomes:
Upon the successful completion of this course

a. The student must know the definition of the various quantities related to soil mechanics and establish their inter-relationships.
b. The student should be able to know the methods of determination of the various index properties of the soils and classify the soils.
c. The student should be able to know the importance of the different engineering properties of the soil such as compaction, permeability, consolidation and shear strength and determine them in the laboratory.
d. The student should be able to apply the above concepts in day-to-day civil engineering practice.

UNIT – I

Introduction: Soil formation – soil structure and clay mineralogy – Adsorbed water – Mass- volume relationship –Relative density

Index Properties of Soils: Grain size analysis – Sieve and Hydrometer methods – consistency limits and indices – Various Types of soil Classifications – Unified soil classification and I.S. Soil classification.

UNIT –II

Permeability: Soil water – capillary rise – One dimensioned flow of water through soils – Darcy's law- permeability – Factors affecting –laboratory determination of coefficient of permeability – Permeability of layered systems.

Geostatic Stresses: Total, neutral and effective stresses –quick sand condition Seepage: 2-D flow and Laplace's equation-Seepage through soils–Flow nets: Characteristics and Uses.

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UNIT – III

Stress Distribution In Soils: Stresses induced by applied loads - Boussinesq's and Westergaard's theories for point loads and areas of different shapes– Newmark's influence chart – 2:1 stress distribution method.

UNIT – IV

Compaction: Mechanism of compaction – factors affecting – effects of compaction on soil properties - compaction control.

Consolidation: Compressibility of soils –e-p and e-log p curves – Stress history – Concept of consolidation - Spring Analogy - Terzaghi's theory of one-dimensional Consolidation – Time rate of consolidation and degree of consolidation – Determination of coefficient of consolidation (c_v) - Over consolidated and normally consolidated clays.

UNIT – V

Shear Strength of Soils: Basic mechanism of shear strength -Mohr – Coulomb Failure theories – Stress-Strain behavior of Sands - Critical Void Ratio – Stress-Strain behavior of clays – Shear Strength determination- various drainage conditions.

TEXT BOOKS:

1. Gopal Ranjan and A.S.R.Rao, "Basic and Applied Soil Mechanics", New Age International Publishers.
2. V.N.S.Murthy, "Soil Mechanics and Foundation Engineering", CBS publishers
3. M.Palani Kumar, "Soil Mechanics", PHI Learning

REFERENCES:

1. D.W.Taylor, "Fundamentals of Soil Mechanics", Wiley.
2. Holtz and Kovacs, "An introduction to Geotechnical Engineering" Prentice Hall
3. Donald P. Coduto, Man-chu Ronald Young and William A. Kitch.

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III Year – I Semester	PROFESSIONAL CORE COURSE LAB	L	T	P	C
		0	0	3	1.5
PC SURVEYING FIELD WORK – II					

List of Experiments

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. Tachometric Survey: Heights and distance problems using tachometric principles.

5. One Exercise on Curve setting.

6. One Exercise on contours.

7. Total Station: Introduction to total station and practicing setting up, leveling up and elimination of parallax error.

8. Total Station: Determination of area using total station.

9. Total Station: Traversing

10. Total Station: Contouring

11. Total Station: Determination of Remote height.

12. Total Station: distance between two inaccessible points.

Note: Any 10 field work assignments must be completed

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III Year – I Semester	PROFESSIONAL CORE COURSE	L	T	P	C
		0	0	3	1.5
PC GEOTECHNICAL ENGINEERING LAB					

Learning Objectives:
The objective of this course is:

- To determine the index properties for soil classification – Grain size distribution &Atterberg's limits.
- To determine the engineering properties – Permeability, Compaction, consolidation, shear strength parameters& CBR value.
- To find the degree of swelling by DFS test.

1. To impart knowledge of determination of index properties required for classification of soils.
2. To teach how to determine compaction characteristics and consolidation behavior from relevant lab tests; to determine permeability of soils.
3. To teach how to determine shear parameters of soil through different laboratory tests.

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

a. Determine index properties of soil and classify them.
b. Determine permeability of soils.
c. Determine Compaction, Consolidation and shear strength characteristics.

SYLLABUS:

LIST OF EXPERIMENTS

1. Specific gravity, G
2. Atterberg's Limits.
3. Field density-Core cutter and Sand replacement methods
4. Grain size analysis by sieving
5. Permeability of soil - Constant and Variable head tests
6. Compaction test
7. Consolidation test (to be demonstrated)
8. Direct Shear test
9. Triaxial Compression test
10. Unconfined Compression test
11. Vane Shear test
12. Differential free swell (DFS)
13. Field Plate Load Test demo
14. Field CBR demo

At least **Eight** experiments shall be conducted.

LIST OF EQUIPMENT:

1. Casagrande's liquid limit apparatus.
2. Apparatus for plastic and shrinkage limits
3. Field density apparatus for
   a) Core cutter method
   b) Sand replacement method

4. Set of sieves: 4.75mm, 2mm, 1mm, 0.6mm, 0.42mm, 0.3mm, 0.15mm, and 0.075mm.
5. Hydrometer
6. Permeability apparatus for
   a) Constant head test
   b) Variable head test
7. Universal auto compactor for I.S light and heavy compaction tests.
8. Shaking table, funnel for sand raining technique.
9. Apparatus for CBR test
10. 10 tons loading frame with proving rings of 0.5 tons and 5 tons capacity
11. One dimensional consolation test apparatus with all accessories.
12. Triaxial cell with provision for accommodating 38 mm dia specimens.
13. Box shear test apparatus
14. Laboratory vane shear apparatus.
15. Hot air ovens (range of temperature 50^0 - 150^0C)

References:

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

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DEPARTMENT OF CIVIL ENGINEERING

III Year – I Semester	Skill advanced course/ soft skill course	L	T	P	C
		1	0	2	2
SC- DESIGN OF SPECIAL STRUCTURES					

Course Objectives

- Equipping students with the professional knowledge in the design and construction of Industrial chimneys and Water tanks
- To get the professional knowledge in the design of service reservoir and Estimation of drains for village
- To understand the design of spillway for low and medium height dams
- To estimate the concrete roads and rain water harvesting ponds

1. Design of Industrial Chimney
2. Design of water tank for apartment
3. Design of service reservoir for village
4. Design of spillway for low and medium height dams.
5. Design and estimate of Concrete Roads
6. Design and estimate of Rainwater harvesting ponds
7. Design and estimate of drains for a village

Reference Books

1) Tall Building Structures: Analysis and design, B. S. Smith and A. Coull, Wiley India Pvt Ltd., New Delhi, 2011.
2) Tall Chimneys: Design and Construction, S. N. Manohar, Tata McGraw Hill Publishing Company Ltd., New Delhi, 1985.
3) IRC SP 042: Guidelines on Road Drainage. Indian Roads Congress, 2014.
4) Handbook of Applied Hydrology, Vijay P. Singh, Tata McGraw Hill Publishing Company Ltd., New Delhi, 2017.
5) Dam Engineering, B. N. Asthana, Deepak Khare, Capital Publishing Company, 2019.
Concrete Roads and Pavements, Edward Smith Hanson, Nabu Press, 2013
6) Rainwater Harvesting and Conservation Manual, Central Public Works Department, Government of India (Available in public domain), 2002.
7) Design of Road Drainage System, S. N. Sachdeva, Createspace Independent Publishing Platform, 2018

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III Year – I Semester	Mandatory course	L	T	P	C
		2	0	0	0
MC (501) PROFESSIONAL ETHICS AND HUMAN VALUES					

Course Objectives: To give basic insights and inputs to the student to inculcate Human values to grow as responsible human beings with proper personality. Professional Ethics instills the student to maintain ethical conduct and discharge their professional duties.

UNIT I: Human Values:

Morals, Values and Ethics – Integrity –Trustworthiness - Work Ethics – Service Learning – Civic Virtue – Respect for others – Living Peacefully – Caring – Sharing – Honesty –Courage – Value Time – Co-operation – Commitment – Empathy – Self-confidence – Spirituality- Character.

Principles for Harmony:
Truthfulness – Customs and Traditions -Value Education – Human Dignity – Human Rights –Fundamental Duties - Aspirations and Harmony (I, We & Nature) – Gender Bias - Emotional Intelligence – Salovey – Mayer Model – Emotional Competencies – Conscientiousness.

UNIT II: Engineering Ethics and Social Experimentation:

History of Ethics - Need of Engineering Ethics - Senses of Engineering Ethics- Profession and Professionalism —Self Interest - Moral Autonomy – Utilitarianism – Virtue Theory - Uses of Ethical Theories - Deontology- Types of Inquiry –Kohlberg's Theory - Gilligan's Argument –Heinz's Dilemma - Comparison with Standard Experiments — Learning from the Past –Engineers as Managers – Consultants and Leaders – Balanced Outlook on Law - Role of Codes – Codes and Experimental Nature of Engineering.

UNIT III: Engineers' Responsibilities towards Safety and Risk:

Concept of Safety - Safety and Risk – Types of Risks – Voluntary v/s Involuntary Risk –Consequences - Risk Assessment – Accountability – Liability - Reversible Effects - Threshold Levels of Risk - Delayed v/s Immediate Risk - Safety and the Engineer – Designing for Safety – Risk-Benefit Analysis-Accidents.

UNIT IV: Engineers' Duties and Rights:

Concept of Duty - Professional Duties – Collegiality - Techniques for Achieving Collegiality –Senses of Loyalty - Consensus and Controversy - Professional and Individual Rights –Confidential and Proprietary Information - Conflict of Interest-Ethical egoism - Collective Bargaining –Confidentiality - Gifts and Bribes - Problem solving-Occupational Crimes- Industrial Espionage Price Fixing-Whistle Blowing.

UNIT V: Global Issues:

Globalization and MNCs –Cross Culture Issues - Business Ethics – Media Ethics - Environmental Ethics – Endangering Lives - Bio Ethics - Computer Ethics - War Ethics – Research Ethics -Intellectual Property Rights.

- Related Cases Shall is dealt where ever necessary.

Course Outcomes: It gives a comprehensive understanding of a variety issues that are encountered by every professional in discharging professional duties.

It provides the student the sensitivity and global outlook in the contemporary world to fulfill the professional obligations effectively.

TEXT BOOKS:

1. Professional Ethics by R. Subramanian – Oxford Publications, New Delhi.

2. Ethics in Engineering by Mike W. Martin and Roland Schinzinger - Tata McGraw-Hill –

2003.

REFERENCE BOOKS:

3. Professional Ethics and Morals by Prof.A.R.Aryasri, DharanikotaSuyodhana - Maruthi

Publications.

4. Engineering Ethics by Harris, Pritchard and Rabin's, Cengage Learning, New Delhi.

5. Human Values & Professional Ethics by S. B. Gogate, Vikas Publishing House Pvt. Ltd.,

Noida.

6. Engineering Ethics & Human Values by M.Govindarajan, S.Natarajan and V.S.SenthilKumarPHI Learning Pvt. Ltd – 2009.

7. Professional Ethics and Human Values by A. Alavudeen, R.Kalil Rahman and M.

Jayakumaran – University Science Press.

8. Professional Ethics and Human Values by Prof.D.R.Kiran-Tata McGraw-Hill – 2013

Human Values and Professional Ethics by Jayshree Suresh and B. S. Raghavan, S.Chand

Publication.

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PROFESSIONAL ELECTIVE	PE-501	L	T	P	C
		3	0	0	3
I a) CONSTRUCTION TECHNOLOGY &MANAGEMENT					

Course Learning Objectives:

The objective of this course is:

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

Course Outcomes:

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

1. appreciate the importance of construction planning
2. understand the functioning of various earth moving equipment
3. know the methods of production of aggregate products and concreting
4. apply the gained knowledge to project management and construction techniques

Course Articulation Matrix:

	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	PSO 3	PSO 4
CO1	-	2	-	-	3	2	2	3	-	-	-	-	-	-	-	-
CO2	-	-	-	-	3	2	2	3	-	-	-	-	-	-	-	-
CO3	-	-	-	-	3	-	-	3	-	-	-	-	-	-	-	-
CO4	-	-	-	-	3	3	-	3	-	-	-	-	-	-	-	-
CO5	-	-	-	-	3	-	-	-	-	-	-	-	-	-	-	-

1 - Slightly 2 - Moderately 3 – Substantially

SYLLABUS:

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

UNIT -II

Project evaluation and review technique – cost analysis - updating – crashing for optimum cost – crashing for optimum resources – allocation of resources introduction to software's for construction management, project management using PRIMAVERA (or) equivalent.

UNIT- III

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

Hoisting and earthwork equipment – hoists – cranes – tractors - bulldozers – graders – scrapers– draglines - clamshell buckets

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UNIT -IV

Concreting equipment — concrete mixers – Batching plants, mobile using plants like "Ajax" etc. 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.
BIM for Civil Engineers (Building Information Modelling)

TEXT BOOKS:

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

REFERENCES:

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

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PROFESSIONAL ELECTIVE	PE-501	L	T	P	C
		3	0	0	3
I b) REMOTE SENSING AND GIS					

Course Learning Objectives:
The course is designed to,

1. Introduce the basic principles of Remote Sensing and GIS techniques.
2. Learn various types of sensors and platforms.
3. Learn concepts of visual and digital image analysis.
4. Understand the principles of spatial analysis.
5. appreciate application of RS and GIS to Civil Engineering

Course outcomes
At the end of the course the student will be able to

a. Be familiar with ground, air and satellite-based sensor platforms.
b. Interpret the aerial photographs and satellite imageries.
c. Create and input spatial data for GIS application.
d. Apply RS and GIS concepts for application in Civil Engineering.

Course Articulation Matrix:

	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	PSO 3	PSO 4
CO 1	3	2	-	-	2	-	-	-	2	-	-	2	3	2	3	2
CO 2	2	1	1	3	2	2	2	1	1	3	2	2	2	2	2	1
CO 3	-	1	1	2	2	-	2	2	2	2	2	2	2	-	3	2
CO 4	-	2	3	3	2	3	3	3	2	3	3	2	2	2	2	2

1 - Slightly 2 - Moderately 3 – Substantially

SYLLABUS:

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, types of resolutions - advantages & limitations, 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 & Recent satellite.

UNIT – II

Image analysis: Introduction, elements of visual interpretations, digital image processing- image pre-processing, image enhancement, image classification, supervised classification, unsupervised classification.

UNIT – III

Geographic Information System: Basic Principles, components, application areas of GIS, map projections. Data entry and preparation: spatial data structures, raster and vector data formats, data inputs,

data manipulation, data retrieval, data analysis and data display.

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.

UNIT – V

RS and GIS applications: Land cover and land use, agriculture, forestry, geology, geomorphology, urban & transportation, Hydrology and Water Resources: Flood zoning and mapping, groundwater prospects, groundwater quality monitoring and potential recharge zones, watershed management of application with case studies.

TEXTBOOKS:

1. 'Remote Sensing and GIS', by Bhatta B, Oxford University Press, (2011) 2nd Edition'.
2. 'Remote Sensing and Image Interpretation, by Lille sand, T.M, R.W. Kiefer and J.W. Chipman, Wiley India Pvt. Ltd., (2015), 7th Edition.
3. 'Remote Sensing - Models and Methods for Image Processing' by Robert A Schowenger, Elsevier publishers, (2009).
4. 'Fundamentals of Remote Sensing' by George Joseph, Universities Press, (2013) 3rd Edition.
5. 'Fundamentals of Geographic Information Systems' by Michael N. Demers, Wiley India Pvt. Ltd, (2012) 4th Edition.

REFERENCES:

1. 'Remote Sensing and its Applications' by Narayan LRA, Universities Press, 2012.
2. 'Concepts and Techniques of Geographical Information System' by Chor Pang Lo and Albert K.W. Yeung, Prentice Hall (India), (2016) 2nd Edition.
3. 'Introduction to Geographic Information Systems' by Kang Tsung Chang, McGraw Hill Higher Education, (2020) 9th Edition.
4. 'Basics of Remote sensing & GIS' by S. Kumar, Laxmi Publications, New Delhi, 2005.
5. 'Principals of Geographical Information Systems' by Burrough P A and R.A. McDonnell, Oxford University Press, 2006.

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PROFESSIONAL ELECTIVE	PE-501	L	T	P	C
		3	0	0	3
I c) ENVIRONMENTAL IMPACT ASSESSMENT					

Course Learning Objectives:

The objective of this course is:

1. To impart knowledge on different concepts of Environmental Impact Assessment
2. To know procedures of risk assessment
3. To learn the EIA methodologies and the criterion for selection of EIA methods
4. To know pre-requisites for ISO 14001certification
5. To know the procedures for environmental clearances and audit
6. To appreciate the importance of stakeholder participation in EIA

Course Learning Outcomes

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

a) Prepare EMP, EIS and EIA report, estimate cost benefit ratio of a project
b) Selection of an appropriate EIA methodology
c) Evaluation of impacts on environment
d) Evaluation of risk assessment
e) Know the latest acts and guidelines of MoEF & CC

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
	2	2	1	2	2	2	2	1	2	2	-	-	1	-	-
CO2	1	2	2	1	2	2	2	2	2	1	-	-	-	-	2
CO3	1	2	2	1	2	1	2	2	1	-	-	1	-	-	1
CO4	1	2	2	2	3	2	3	1	3	1	2	1	-	-	1
CO5	1	2	2	2	3	2	3	1	3	1	2	1	-	-	1

1 - Slightly 2 - Moderately 3 – Substantially

SYLLABUS:

UNIT-I:

Basic concepts of EIA: Elements of EIA-factors affecting EIA-Initial environmental Examination- life cycle analysis preparation of Environmental Base map- Classification of environmental parameters – role of stakeholders in the EIA preparation – stages in EIA, Environmental economics, Cost/benefit Analysis - EIS and EMP. Identification of activities- application of remote sensing and GIS for EIA.

UNIT-II:

EIA Methodologies: Introduction, Criteria for the selection of EIA Methodology, E I A methods, Ad-hoc methods, matrix methods, Network method Environmental Media Quality Index method, overlay methods.

Impact of Developmental Activities and Land use: Introduction and Methodology for the assessment of soil and ground water, Delineation of study area.

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UNIT-III

Procurement of relevant soil quality, Impact prediction, Assessment of Impact significance, Identification and Incorporation of mitigation measures - E I A with reference to surface water, Air and Biological environment: Methodology for the assessment of Impacts on surface water environment, generalized approach for assessment of Air pollution Impact.

UNIT-IV: Assessment of Impact of development Activities on Vegetation and wildlife, Environmental Impact of Deforestation. Environmental Risk Assessment and Risk management in EIA: Risk assessment and treatment of uncertainty-key stages in performing an Environmental Risk Assessment- Advantages of Environmental Risk Assessment

UNIT-V EIA: MoEF&CC Acts, Notifications and Guidelines: Provisions in the EIA notification, procedure for environmental clearance, and 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 ISO14000. Environmental compliance reports. Case studies and preparation of EIA statement for various Industries.

Text Books:

1. Environmental Impact Assessment, Canter Larry W., McGraw-Hill education Edi (1996)
2. Environmental Impact Assessment Methodologies, Y. Anjaneyulu, B. S. Publication, Sultan Bazar, Hyderabad.

References:

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

Date: 05th & 06th March 2022

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PROFESSIONAL ELECTIVE	PE-501	L	T	P	C
		3	0	0	3
I d). LOW-COST HOUSING					

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	-	-	2	-	-	1	3	-	-	-	-	2	2	-	3	-
CO2	-	-	3	2	-	3	3	-	-	-	-	2	1	2	3	-
CO3	-	2	3	3	-	2	3	-	-	-	-	2	3	2	3	1
CO4	-	-	3	-	-	3	3	-	-	-	-	2	1	2	3	1
CO5	-	2	3	3	-	2	3	-	-	-	-	2	3	2	3	1

1 - Slightly 2 - Moderately 3 – Substantially

SYLLABUS

UNIT – I

Housing Scenario Status of urban housing- Status of Rural Housing,
Housing Finance: Introducing- Existing finance system in India- Government role as facilitator Status at Rural Housing Finance- Impedimental in housing finance and related issues

UNIT- II

Land Use and Physical Planning for Housing:
Planning of urban land- Urban land ceiling and regulation act- Efficiency of building bye laws - Residential Densities

Housing the Urban Poor: Living conditions in slums- Approaches and strategies for housing urban poor

UNIT-III

Development and Adopt on of Low-Cost Housing Technology
Adoption of innovative cost effective construction techniques- Adoption of precast elements in partial prefabrication- Adopting of total prefabrication of mass housing in India- General remarks on pre cast rooting/flooring systems- Economical wall system- Single Brick thick loading bearing wall- 19cm thick load bearing masonry walls- Half brick thick load bearing wall-Fly ash, gypsum thick for masonry- Stone Block masonry- Adoption of precast R.C. plank and join system for roof/floor in the building

Alternative Building Materials for Low Cost Housing: Substitute for scarce materials- Ferro cement- Gypsum boards- Timber substitutions- Industrial wastes- Agricultural wastes

UNIT- IV

Low Cost Infrastructure Services
Present status- Technological options- Low cost sanitation's- Domestic wall- Water supply energy

Rural Housing: Introduction- traditional practice of rural housing continuous- Mud Housing technology- Mud roofs- Characteristics of mud- Fire resistant treatment for thatched roof- Soil

stabilization- Rural Housing programs

UNIT-V

Housing in Disaster Prone Areas

Earthquake- Damages to houses- Traditional Houses in disaster prone areas Type of Damages and Railways of non-engineered buildings- Repair and restore action of earthquake Damaged non-engineered buildings recommendations for future constructions- Requirements of structural safety of thin precast roofing units against - Earthquake forces- Status of R&D in earthquake strengthening measures- Floods- cyclone- future safety

TEXT BOOKS:

1. Building materials for low –income houses – International council for building research studies and documentation.
2. Modern trends in housing in development countries – A.G. Madhava Rao, D.S. Ramachandra Murthy & G. Annamalai
3. Light weight concrete- Academic Kiado- Rudhai. G – Publishing home of Hungarian Academy of Sciences 1963.

REFERENCE BOOKS:

1. Building Systems for Low Income Housing, Ashok Kumar Jain; Management Publishing House, 1992
2. Hand book of low-cost housing - by A. K. Lal – New age international publishers.
3. Low Cost Housing in Developing Countries, Guru Charan Mathur; For Centre for Science & Technology of the Non-Aligned and Other Developing Countries, Oxford & IBH Publishing Company, 1993

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India
DEPARTMENT OF CIVIL ENGINEERING

III Year – II Semester	PROFESSIONAL CORE COURSE	L	T	P	C
		3	0	0	3
PC 601 DESIGN AND DRAWING OF STEEL STRUCTURES					

Course Learning Objectives:

The objective of this course is to:

- Familiarize Students with different types of Connections and relevant IS codes
- Equip student with concepts of design of flexural members
- Understand Design of tension and compression members in trusses
- Familiarize students with types of Columns, column bases and their Design
- Familiarize students with Plate girder and Gantry Girder and their Design

Course Outcomes:

At the end of this course the student will be able to

- Work with relevant IS codes
- Carryout analysis and design of flexural members and detailing
- Design compression members of different types with connection detailing
- Design Plate Girder and Gantry Girder with connection detailing
- Produce the drawings pertaining to different components of steel structures

UNIT – I Types of structural steel – Mechanical properties of steel – Concepts of plasticity – yield strength -Loads and Stresses – Local buckling behaviour of steel. Concepts of limit State Design – Different Limit States
– Load combinations for different Limit states - Design Strengths- deflection limits – serviceability – stabilitycheck;
Connections: Design of Connections– Different types of connections – Bolted connections –Design strength
– efficiency of joint
Welded connections: Advantages and disadvantages - Strength of welds-Butt and fillet welds: Permissible stresses – IS Code requirements. Design of fillet weld subjected to in-plane moment acting in the plane and at right angles to the plane of the joints.

All units i.e. from unit II to unit-VI to be taught in Limit State Design and in Welded connections only.

UNIT – II

Plastic Analysis*;* Plastic moment – Plastic section modulus - Plastic analysis of continuous beams
Beams: Allowable stresses, design requirements as per IS Code-Design of simple and compound beams-Curtailment of flange plates, Beam to beam connection, check for deflection, shear, buckling, check for bearing, laterally unsupported beams.

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DEPARTMENT OF CIVIL ENGINEERING

UNIT –III Compression and Tension Members: Effective length - Slenderness ratio – permissible stresses. Design of compression members, and struts. Built up compression members – Design of lacings and battens. Design Principles of Eccentrically loaded columns, Splicing of columns.
Roof Truss Element: Different types of trusses – Design loads – Load combinations as per IS Codes –Design of simple roof trusses involving design of purlins, rafters and joints – tubular trusses.

UNIT – IV Design of Column Foundations: Design of slab base and gusseted base. Column bases subjected moment.

UNIT – V Design of Plate Girder: Design consideration – I S Code recommendations Design of plate girder - Welded – Curtailment of flange plates, stiffeners – splicing and connections. **Design of Gantry Girder:** impact factors - longitudinal forces, Design of Gantry girders.
NOTE: Welding connections should be used in Units II – VI. The students should prepare the following plates.
Plate 1 Detailing of simple beams,
Plate 2 Detailing of Compound beams including curtailment of flange plates.
Plate 3 Detailing ofColumn including lacing and battens,
Plate 4 Detailing of Column bases – slab base and gusseted base,
Plate 5 Detailing of steel roof trusses including joint details and
Plate 6 Detailing of Plate girder including curtailment, splicing and stiffeners.

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. Limit State Design of steel structures, S. K. Duggal, Tata Mc Graw Hill, New Delhi

REFERENCES
1. Structural Design in Steel, SarwarAlamRaz, New Age International Publishers, New Delhi
2. Structural Design and Drawing by N.Krishna Raju, Universities Press
3. Design of Steel Structures by K.S.Sai Ram, Person India Education Services

IS Codes:

1) IS-I800:2007, Indian Standard Code for General Construction in Steel, 3rd revision, Indian Standards Institution, New Delhi, 2008.
2) IS – 875, Code of practice for design loads (other than earth quake) for buildings and structures (Part-1-Part 5), Bureau of Indian standards.
3) Steel Tables.

These codes and steel tables are permitted to use in the examinations.

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DEPARTMENT OF CIVIL ENGINEERING

III Year – II Semester	PROFESSIONAL CORE COURSE	L	T	P	C
		3	0	0	3
PC 602 WATER RESOURCES ENGINEERING					

Course Learning Objectives:
The course is designed to make the students,

1. Estimate irrigation water requirements.
2. Design irrigation canals
3. Understand hydrologic cycle and its relevance to Civil engineering.
4. Learn physical processes and their interactions in hydrology.
5. Learn measurement and estimation of the components of hydrologic cycle.
6. Have an overview and understanding of Hydrographs.

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Course Outcomes:
At the end of the course the students are expected to

a. Have a thorough understanding of the theories and principles governing the hydrologic processes.
b. Be able to quantify hydrologic components and apply concepts in hydrologic design of water resources projects.
c. Develop Intensity-Duration-Frequency and Depth-Area Duration curves to design hydraulic structures.
d. Develop design storms and carry out frequency analysis.
e. Develop flow mass curve and flow duration curve, apply hydrograph analysis in the design of water resources projects.
f. Develop unit hydrograph and synthetic hydrograph.

Course Articulation Matrix:

g.

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
CO1	3	2	3	2	3	1	2	-	-	-	-	1	2	-	3
CO2	2	3	1	2	2	-	-	-	-	-	-	1	3	-	1
CO3	3	3	3	1	2	1	1	-	-	-	-	1	2	-	3
CO4	2	3	1	2	2	-	-	-	-	-	-	1	3	-	1
CO5	3	2	3	2	2	1	2	-	-	-	-	1	1	-	3

1 - Slightly 2 - Moderately 3 – Substantially

SYLLABUS:

UNIT – I
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.

UNIT-II
Canals: Classification, design of non-erodible canals - methods of economic section and maximum permissible velocity, economics of canal lining, design of erodible canals -Kennedy's silt theory and Lacey's regime theory, balancing depth of cutting.
Diversion Head Works: Types of diversion head works, weirs and barrages, layout of diversion head

works, components. Causes and failures of weirs on permeable foundations, Bligh's creep theory, Khosla's theory, design of impervious floors for subsurface flow, exit gradient.

UNIT-III

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

Precipitation: Types and forms, measurement, introduction to radar measurement of rain fall, 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-IV

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

Runoff: Factors affecting runoff, components, empirical formulae, tables and curves, stream gauging, rating curve, flow mass curve and flow duration curve.

UNIT-V

Hydrograph analysis: 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, dimensionless unit hydrograph, synthetic unit hydrograph, introduction to IUH.

TEXTBOOKS:

1. 'Irrigation and Waterpower Engineering' by Punmia B C, P.B.B Lal, A.K. Jain and A.K. Jain (2009), Laxmi Publications Pvt. Ltd., New Delhi
2. 'Irrigation Water Resources and Waterpower Engineering' by Modi P N (2011), Standard Book House, New Delhi
3. 'Engineering Hydrology' by Subramanya, K, Tata McGraw-Hill Education Pvt Ltd, (2013), New Delhi.
4. 'Engineering Hydrology' by Jayarami Reddy, P, Laxmi Publications Pvt. Ltd., (2013), New Delhi
5. 'Water Resources Engineering', Mays L.W, Wiley India Pvt. Ltd, (2013).
6. 'Hydrology and Water Resources Engineering' by Patra K.C., Narosa Publications, (2011).

REFERENCES:

1. 'Water Resources Engineering' by Mays L.W (2013), Wiley India Pvt. Ltd, New Delhi.
2. 'Irrigation Engineering' by Sharma R.K. and Sharma, T. K (2012), S. Chand & Co Publishers.
3. 'Water Resources Engineering' by Satyanarayana Murthy Challa (2008), New Age International Publishers.

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Date: 05th & 06th March 2022

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KAKINADA – 533 003, Andhra Pradesh, India
DEPARTMENT OF CIVIL ENGINEERING

III Year – II Semester	PROFESSIONAL CORE COURSE	L	T	P	C
		3	0	0	3
PC 603 GEOTECHNICAL ENGINEERING – II					

Course Learning Objectives:
The objective of this course is:

1. To impart to the student knowledge of types of shallow foundations and theories required for the determination of their bearing capacity.
2. To enable the student to compute immediate and consolidation settlements of shallow foundations.
3. To impart the principles of important field tests such as SPT and Plate bearing test.
4. To enable the student to imbibe the concepts of pile foundations and determine their load carrying capacity.

Course Outcomes:
Upon the successful completion of this course:

a. The student must be able to understand the various types of shallow foundations and decide on their location based on soil characteristics.
b. The student must be able to compute the magnitude of foundation settlement and decide on the size of the foundation accordingly.
c. The student must be able to use the field test data and arrive at the bearing capacity.
d. The student must be able to apply the principles of bearing capacity of piles and design them accordingly.

UNIT – I

Soil Exploration: Need – Methods of soil exploration – Boring and Sampling methods – Field tests – Penetration Tests – Pressure meter – planning of Program and preparation of soil investigation report.

UNIT – II

Earth And 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 – Cullman's graphical method - earth pressures in layered soils.

UNIT-III

Shallow Foundations – Bearing Capacity Criteria: Types of foundations and factors to be considered in their location - Bearing capacity – criteria for determination of bearing capacity

Factors influencing bearing capacity – analytical methods to determine bearing capacity – Terzaghi's theory - IS Methods.

UNIT-IV

Shallow Foundations – Settlement Criteria: Safe bearing pressure based on N- value – allowable bearing pressure; safe bearing capacity and settlement from plate load test – Types of foundation settlements and their determination - allowable settlements of structures.

UNIT -V

Deep Foundations:

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

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

TEXT BOOKS:

1. 'Principles of Foundation Engineering' by Das, B.M., - (2011) –6th edition (Indian edition) Cengage learning
2. 'Basic and Applied Soil Mechanics' by Gopal Ranjan& ASR Rao, New Age International Pvt. Ltd, (2004).
3. Soil mechanics & foundation engineering by Arora

REFERENCES:

1. Foundation Analysis and Design' by Bowles, J.E., (1988) – 4th Edition, McGraw-Hill Publishing Company, New York.
2. 'Theory and Practice of Foundation Design' by N.N.SOM & S.C.DAS PHI Learning Private limited.

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DEPARTMENT OF CIVIL ENGINEERING

III Year – II Semester	PROFESSIONAL CORE COURSE LAB	L	T	P	C
		0	0	3	1.5
PC Lab- ESTIMATION, COSTING AND CONTRACTS LAB					

Course Learning Objectives:
The objective of this course is to enable the students to:
1. Understand the quantity calculations of different components of the buildings.
2. Understand the rate analysis of different quantities of the buildings components.
3. Learn various specifications and components of the buildings.

Course Outcomes:
Upon the successful completion of this course:
a. The student should be able to determine the quantities of different components of buildings.
b. The student should be in a position to find the cost of various building components.
c. The student should be capable of finalizing the value of structures.

SYLLABUS:
UNIT – I
Contracts – Types of contracts – Contract Documents – Conditions of contract, Valuation of buildings-concepts of e-procurement and reverse auctions. Standard specifications for different items of building construction.
UNIT – II
General items of work in Building – Standard Units Principles of working out quantities for detailed and abstract estimates –Approximate method of Estimating.
UNIT – III
Rate Analysis – Working out data for various items of work over head and contingent charges.
Earthwork for roads and canals, Reinforcement bar bending and bar requirement schedules.
UNIT-IV
Detailed Estimation of Buildings using individual wall method for single, double and four roomed buildings.
UNIT -V
Detailed Estimation of Buildings using centre line method for single, double and four roomed buildings.
Standard software's like building estimator etc.

TEXT BOOKS:
1. 'Estimating and Costing' by B.N. Dutta, UBS publishers, 2000.
2. 'Civil Engineering Contracts and Estimates' by B. S. Patil, Universities Press (India) Pvt. Ltd., Hyd.
3. 'Construction Planning and Technology' by Rajiv Gupta, CBS Publishers & Distributors Pvt. Ltd. New Delhi.
4. 'Estimating and Costing' by G.S. Birdie.

REFERENCES:
1. 'Standard Schedule of rates and standard data book' by public works department.
2. IS 1200 (Parts I to XXV-1974/ Method of Measurement of Building & Civil Engg Works – B.I.S.)
3. 'Estimation, Costing and Specifications' by M. Chakraborthi; Laxmi publications.
4. National Building Code

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DEPARTMENT OF CIVIL ENGINEERING

III Year – II Semester	PROFESSIONAL CORE COURSE LAB	L	T	P	C
		0	0	3	1.5
PC-Lab-REMOTE SENSING & GIS LAB					

Learning Objectives:
The course is designed to
1. Understand the process Geo-referencing, Preparation of Base map from of Topo sheet.
2. Digitization, creation of thematic maps from topo sheets.
3. Developing Digital Elevation model
4. Interpretation and Estimation of features of Land Use/land cover details from satellite imagery.
5. Learn to apply GIS software to simple problems in water resources, transportation engineering and Agriculture

Outcomes
At the end of the course the student will be able to
a. Work comfortably on GIS software
b. Digitize and create thematic map and extract important features
c. Develop digital elevation model
d. Interpretation and Estimation of features from satellite imagery.
e. Analyze and Modelling using GIS software.

SYLLABUS:
GIS:
SOFTWARES:
1. Arc GIS 10.1
2. ERDAS Imagine 13
3. MapInfo 6.5
4. ILWIS or Any one or Equivalent.

EXCERCISES IN GIS:
1. Geo-referencing of Topo sheet.
2. Preparation of Base map from topo sheet including legend, scale and annotation
3 Digitization of Map/Topo sheet
4. Developing Digital Elevation model
5. Interpretation of Land Use/land cover detail from satellite imagery
6. Creation of thematic maps.
7. Estimation of features and interpretation
8. Simple applications of Remote Sensing & GIS in water Resources
9. Simple applications of Remote Sensing & GIS in Transportation
10. Simple applications of Remote Sensing & GIS in Agriculture

TEXT BOOK:
2. Concept and Techniques of GIS' by C.P.L.O. Albert, K.W. Yong, Printice Hall Publishers
3. Software Manuals.

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DEPARTMENT OF CIVIL ENGINEERING

III Year – II Semester	PROFESSIONAL CORE COURSE LAB	L	T	P	C
		0	0	3	1.5
PC-Lab -CIVIL ENGINEERING PRACTICE LAB					

COURSE OBJECTIVES:

- Introducing practical aspects of Civil Engineering profession to the students
- Equipping students with the professional knowledge in the design and construction procedures of various Civil Engineering projects
- Introducing the important codes and by-laws that will benefit young professionals

SYLLABUS:

UNIT – I Introduction to Civil Engineering Projects
Types of Infrastructural projects, Fundamentals of construction, Key aspects of Civil Engineering structures, foundations, buildings, roads, bridges, tunnels, pipelines, dams and ports, Stages of project execution, Preparation of reports

UNIT – II Principles of practice
Civil engineering works, Contracts and sub-contracts. Basic business laws of relations, Job planning and execution, Field investigations in Geotechnical Engineering, Preparation of reports, Estimation of bearing capacity and settlement of foundations from field data, Estimation of runoff, Construction of hydrographs, flood forecasting, Analysis and design of water distribution networks, Design of sewers, Determination of highway capacity, Highway geometric design, Design of flexible and rigid pavements, Traffic Signal Design

UNIT – III Codes of Practice
Important codes of Civil Engineering, Environmental impacts, Safety rules for construction, Energy consumption, Sustainability and recycling practices, Optimization and costing

UNIT – IV Case Studies
Important case studies of Civil Engineering including buildings, bridges, ports, offshore structures, airports, stories of success, cases of failure, retrofitting, field visits

COURSE LEARNING OUTCOMES
After completing this course, the student

- Gains adequate confidence to work as a consulting engineer in any field of Civil Engineering
- Understands the duties, responsibilities and codal practices of Civil Engineering profession
- Will be ready to plan, design and execute Civil Engineering projects
- Can build safety related and environmental impact related codal protocols into project planning and execution.
- Can optimize project costs using sustainability concepts

Textbooks:

1. The Civil Engineering Handbook: Edited by W.F. Chen and J.Y. Richard Liew, CRC Press
2. Garold D. Oberlander (1993). Project Management for Engineering and Construction. McGraw Hill Book Co, Singapore.
3. Failure Case Studies in Civil Engineering: Structures, Foundations, and the Geo environment, Edited by Bosela, Paul A., Brady, Pamalee. Delatte, Norbert J., Parfitt, M. Published by ASCE.

References:

1. IS codes of relevance to Civil Engineering
2. National Building Code of India, 2016

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DEPARTMENT OF CIVIL ENGINEERING

III Year – II Semester	SKILL ADVANCED COURSE/ SOFT SKILL COURSE- **LAB**	**L**	**T**	**P**	**C**
		1	**0**	**2**	**2**
SC-Lab-CAD LAB					

Course Objectives: The objectives of the course are to

1. **Learn** the usage of any fundamental software for design
2. **Create** geometries using pre-processor
3. **Analyze** and Interpret the results using post processor
4. **Design** the structural elements

Course Outcomes
After the completion of the course student should be able to

a) Model the geometry of real-world structure Represent the physical model of structural element/structure
b) Perform analysis
c) Interpret from the Post processing results
d) Design the structural elements and a system as per IS Codes

LIST OF EXPERIMENTS

1. Analysis &Design determinate structures using a software
2. Analysis &Design of fixed & continuous beams using a software
3. Analysis & Design of Plane Frames
4. Analysis &Design of space frames subjected to DL & LL
5. Analysis &Design of residential building subjected to all loads (DL,LL,WL,EQL)
6. Analysis & Design of Roof Trusses
7. Design and detailing of built up steel beam
8. Developing a design program for foundation using EXCEL Spread Sheet
9. Detailing of RCC beam and RCC slab
10. Detailing of Steel built up compression member

Note: Drafting of all the exercises is to be carried out using commercially available designing software's.

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DEPARTMENT OF CIVIL ENGINEERING

III Year – II Semester	MANDATORY COURSE	L	T	P	C
		2	0	0	0
MC-EMPLOYABILITY SKILLS					

Preamble: This course is introduced to enhance the soft and hard skills of students based on industry needs and helping the student to get the employment in the competitive industrial environment.

Course Objective: In this course the student should understand:
(i) Aptitude skill, (ii) Soft skills, (iii) Skills required for campus placement interview

Unit 1: Aptitude Skills

Quantitative Aptitude:

Numbers, HCF and LCM, Problems on ages, Averages, Ratio and Proportion, Percentages, Profit and Loss, Partnership, Interest calculations, Time and Work, Time and Distance, Pipes and Cisterns, Mensuration.

Reasoning:

Number and Letter Analogy, Coding and decoding, Odd Man out, Symbols and Notations, Permutations and Combinations, Probability, Data Interpretation, Data Sufficiency, Clocks and Calendars, Deductions, Logical Connectives, Venn Diagrams, Cubes, Binary Logic, Ordering and Sequencing, Blood relations – Syllogisms - Seating arrangement, Analytical Reasoning

Unit 2: Skills - I

Soft Skills: An Introduction – Definition and Significance of Soft Skills; Process, Importance and Measurement of Soft Skill Development. Self-Discovery: Discovering the Self; Setting Goals; Beliefs, Values, Attitude, Virtue. Goal Setting-Vision Vs Mission Vs Goals, SMART Technique to Goal Setting, SWOT Analysis. Self Esteem: Types of Self Esteem, Causes of Low Self Esteem, Merits of Positive Self Esteem and Steps to build a positive Self Esteem; Art of Compromise, Learn to Say: 'I Don't Know', Being organized, Showing Self-awareness, Self-Assessment for Attainable Career Objectives.

Attitude & Confidence: Attitude Vs Skills Vs Knowledge, Attitude Vs Behavior, Developing Positive Attitude and Confidence; Fear- Public Speaking, Steps to Overcome Fear, developing Positive Thinking and Attitude; Driving out Negativity; Meaning and Theories of Motivation; Enhancing Motivation Levels, Adjusting Your Attitude-Arrogance has no Place in the Workplace, Cultural Sensitivity in the Workplace, Corporate Culture: Learning How to Fit In .Motivational Talk: Team Work, Team Vs Group, Stages in Team Building, Mistakes to avoid and Lessons to Learn.

Unit 3: Skills – II:

Interpersonal Communication: Interpersonal relations; communication models, process and Barriers; team communication; developing interpersonal relationships through effective Communication; essential formal writing skills; corporate communication styles – assertion, Persuasion, negotiation. Listening: Listening Vs Hearing, Possible reasons for why people do not Listen at times, Active Listening Vs Passive Listening, Listening effect on relationships. Public Speaking: Skills, Methods, Strategies and Essential tips for effective public speaking. Group Discussion: Importance, Planning, Elements, Skills assessed; effectively disagreeing, Initiating, Summarizing and Attaining the Objective. On-Verbal Communication: Importance and Elements;

Body Language-Postures, gestures, eye contact.

Teamwork and Leadership Skills: Concept of Teams; Building effective teams; Concept of Leadership and honing Leadership skills. Presentation Skills: Types, Content, Audience Analysis, Essential Tips – Before, During and After, Overcoming Nervousness. Etiquette and Manners: Social and Business. Time Management – Concept, Essentials, Tips.

Unit 4: Personality Development: Meaning, Nature, Features, Stages, Models; Learning Skills; Adaptability Skills. Decision-Making and Problem-Solving Skills: Meaning, Types and Models, Group and Ethical Decision-Making, Problems and Dilemmas in application of these skills. Conflict Management: Conflict - Definition, Nature, Types and Causes; Methods of Conflict Resolution

Stress Management: Stress - Definition, Nature, Types, Symptoms and Causes; Stress Analysis Models and Impact of Stress; Measurement and Management of Stress. Leadership and Assertiveness Skills: A Good Leader; Leaders and Managers; Leadership Theories; Types of Leaders; Leadership Behavior; Assertiveness Skills. Emotional Intelligence: Meaning, History, Features, Components, Intrapersonal and Management Excellence; Strategies to enhance Emotional Intelligence.

Unit 5: Group Discussions (GD):
Stages of a GD, GD Vs Debate, Skills assessed in a GD, Blunders to be avoided, Dos & Don'ts, GD Practice: Conducting practice sessions and Brain Storming Sessions, Evaluation, feedback on their performance

Resume Preparation: Resume Templates, Steps followed for resume preparation, Common mistakes in a resume; Covering letter **Campus Placements Skills**: Stages of Campus Placement, Skills assessed in Campus Placements, Changing scenario and its Challenges & How to get ready, Motivational Talk on Positive Thinking: Beliefs, Thoughts, Actions, Habits & Results (Success);

Interview Skills: Types of Interview, Interviewer and Interviewee – in-depth perspectives; Before, during and after the Interview; Tips for Success, Dress code and Grooming, Dos & Don'ts, Skills assessed in an Interview, Mistakes to be avoided, How to equip oneself to excel; How to handle the typical Interview Questions; Mock Interviews: Unconventional HR questions, Practice sessions with Feedback, Simulated Testing: Previous model papers of companies, Business Terminology: Financial Terms such as Debt, Equity, Share, Working Capital, Turnover, Net worth etc.; Vision, Mission, Objectives, Goals, Targets.

Course Outcomes: After studying this course the student should able

(i)To solve aptitude and reasoning problems,

(ii) Apply the soft skills in dealing the issues related to Employability

(iii) Successful in getting employment in campus placement interview

References:

1) B. K. Mitra, Personality Development and Soft Skills, Oxford University Press, 2011.
2) S.P. Dhanavel, English and Soft Skills, Orient Blackswan, 2010.
3) R.S.Aggarwal, A Modern Approach to Verbal & Non-Verbal Reasoning, S.Chand & Company Ltd., 2018.
4) Raman, Meenakshi & Sharma, Sangeeta, Technical Communication Principles and Practice, Oxford University Press, 2011.

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KAKINADA – 533 003, Andhra Pradesh, India
DEPARTMENT OF CIVIL ENGINEERING

III Year – II Semester	Professional Elective-II	L	T	P	C
		3	0	0	3
PE-601-II a) ADVANCED STRUCTURAL ANALYSIS					

Course Outcomes:

At the end of this course; the student will be able to

- Differentiate Determinate and Indeterminate Structures
- Carryout lateral Load analysis of structures
- Analyze Cable and Suspension Bridge structures
- Analyze structures using Moment Distribution, Kani's Method and Matrix methods

SYLLABUS:

UNIT – I

Energy Theorems: Introduction-Strain energy in linear elastic system, expression of strain energy due to axial load, bending moment and shear forces - Castigliano'sfirst theorem-Deflections of simple beams and pin jointed plane trusses.

INDETERMINATE TRUSSES: Determination of static and kinematic indeterminacies – Analysis of trusses having single and two degrees of internal and external indeterminacies – Castigliano's second theorem.

UNIT II

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-III Approximate Methods of Analyses: Application to building frames. (i) Portal Method (ii) Cantilever Method (iii) Substitute frame method for approximate analysis of multi-storey frames subjected to gravity loads and lateral loads. Shear force and bending moment diagrams - Elastic curve.

UNIT – IV Cable Structures and Suspension Bridges: Introduction, characteristics of cable, analysis of cables subjected to concentrated and uniformly distributed loads, anchor cable, temperature stresses, analysis of simple suspension bridge, three hinged and two hinged stiffening girder suspension bridges.

UNIT – V Moment Distribution Method: Analysis of Portal frames – including Sway-Substitute frame analysis by two cycle. Slope deflection method: Analysis of Portal frames – including Sway. Analysis of inclined frames. Shear force and bending moment diagrams - Elastic curve.

Kani's Method: Analysis of continuous beams – including settlement of supports and single bay portal frames with and without side sway. Shear force and bending moment diagrams - Elastic curve.

Text Books:

1. Structural Analysis by R.C. Hibbeler, Pearson, New Delhi.
2. Basic Structural Analysis, K U Muthu et. al., IK International Publishing house pvt.Ltd.

References:

1 Indeterminate Structural Analysis, K U Muthu et. al., IK International Publishing house pvt.Ltd.
2 Analysis of Structures- Vol. I and II, V. N. Vazirani and M. M. Ratwani, Khanna Publishers, New Delhi**.**
3 Mechanics of Structures Vol – II by H.J.Shah and S.B.Junnarkar, Charotar Publishing House Pvt. Ltd.
4 Structural Analysis by Devdas Menon, Narosa Publishing Housing Pvt.Ltd.
5 Structural Analysis: A Matrix Approach, G.S.Pandit and S.P.Gupta, Mc Graw Hill Pvt. Ltd.

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III Year – II Semester	Professional Elective-II	L	T	P	C
		3	0	0	3
PE-601- II b). ARCHITECTURE AND TOWN PLANNING					

Course Learning Objectives:
The objectives of this course are:

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, and 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 the successful completion of this course, the student should be able to:

a. Distinguish architectural styles of eastern and western world.
b. Understand the importance of Orders of architecture.
c. Compose spaces of buildings using design concepts, planning principles.
d. Understand the town planning standards, landscaping features and regulations controlling expansion of the towns and the cities.

SYLLABUS:

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, Bhubaneshwar, 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 Wrigt, 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, Mohenjo-Daro, Pataliputra, Delhi, Acropolis (Greece), Jerusalem, Mecca, Rome, London.

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UNIT – IV

Modern Town Planning: Zoning- Roads and road traffic- Housing- Slums, Parks, Play grounds- Public 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.

TEXTBOOKS:

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.

REFERENCES:

1. 'Drafting and Design for Architecture' by Hepler, Cengage Learning
2. 'Architect's Portable Handbook' by John Patten Guthrie – McGrawHill International Publications.
3. 'Modern Ideal Homes for India' by R. S.Deshpande.
4. 'Town and County Planning' by A.J.BrownandH.M.Sherrard.
5. 'Town Design' by Federik Glbbard, Architectural press, London.

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DEPARTMENT OF CIVIL ENGINEERING

III Year – II Semester	Professional Elective-II	L	T	P	C
		3	0	0	3
PE-601- II c). ROAD SAFETY ENGINEERING					

Course Objectives:

1. This module on the fundamental of traffic engineering & some of the statistics methods to analysis the traffic safety.
2. The accident interrogations & risk involved with measures to identity the causes are dealt.
3. The role of road safety in planning the urban infrastructures design is discussed.
4. The various traffic management systems for safety & safety improvement strategies are dealt.

Course Outcomes:

At the end of the course, students will be able to

a) To understand fundamental of Traffic Engineering
b) To investigate & determine the collective factors & remedies of accident involved.
c) To design & planning various road geometrics.
d) To massage the traffic system from road safety point of view.

SYLLABUS:

UNIT I

Introduction to Road Safety:

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

REFERENCES:

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

Date: 05th & 06th March 2022

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DEPARTMENT OF CIVIL ENGINEERING

III Year – II Semester	Professional Elective-II	L	T	P	C
		3	0	0	3
PE-601- II (d) - TRAFFIC ENGINEERING					

Course Learning Objectives:
The objectives of this course are:
1. To determine various components and characteristics of traffic.
2. To apply various traffic control devices and principles of highway safety.
3. To understand the detrimental effects of traffic on environment
4. To carry out highway capacity and level of service analysis.
5. To learn about intelligent vehicle highway systems.

Course Outcomes:
At the end of course, Students will be able to
a. Determine traffic speed, volume, travel time and density.
b. Design traffic signals
c. Determine highway capacity and LOS

SYLLABUS:
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

Environmental Considerations: Air pollution: Kinds of pollutants; Air pollution standards; Measures of air quality; modelling and control. Noise pollution: Measurement of sound levels; Acceptable limits, Prediction of noise levels, Traffic noise control, Air and Noise pollution mitigation measures.

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UNIT- V

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.

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

REFERENCES:

1. 'Traffic Engineering Hand Book' by Institute of Transportation Engineers, 4 Ed., Prentice Hall
2. 'Traffic Engineering' by Mc Shane, WR and RP Roess, Prentice Hall
3. 'Highway Traffic analysis and design' by Salter RJ and NB Hounsell, 3rd ed., Macmillan
4. 'Traffic Planning and Engineering' by Hobbs FD., Pergamon press
5. 'Traffic flow fundamentals' by May, AD., Prentice Hall

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IV-Year – I Semester	HUMANITIES AND SOCIAL SCIENCE ELECTIVE	L	T	P	C
		3	0	0	3
HSC701-INTELLECTUAL PROPERTY RIGHTS AND PATENTS					

Course Outcomes (CO):

After studying these units, the student is expected to be able to:

i) understood the significance of innovations, distinguish different kinds of IPRs and know the legislative framework, practice and procedure relating to Patents, Copyrights, Trademarks, Designs, Trade Secrets, Geographical Indications, Traditional Knowledge and certain emerging areas.

ii) understood the various components of copyright law, its protection and enforcement to know the application of copyright law, its duration, advantages and the issues of 'fair use' and 'plagiarism' in the digital era.

iii) Understood the Patent law in India and its global instruments and spell out the procedural requirements of novelty, non-obviousness and inventive step involved in obtaining a Patent, its exclusive rights besides assignment and licensing patterns and how the patent does benefit the society.

iv) understood the conceptual and legal framework, procedural requirements relating to Trade Marks and its infringement and gives an insight how the Trademark is commercially advantageous to its owner and to prevent unfair competition and further safeguarding the trade secrets of the business enterprises.

v) Understood the importance of E-commerce, data security, online transactions and how the confidentiality and privacy can be safeguarded through the digital signatures and the prevention and punishment of cybercrimes under the law.

SYLLABUS:

Unit I: Introduction to Intellectual Property Rights (IPR)

Concept of Property - Introduction to IPR – IPR Tool Kit – International Instruments and IPR – WIPO - TRIPS – WTO – IPR Laws - IPR Protection and Regulation - Copyrights and Neighboring Rights – Industrial Property – Patents – Designs - Traditional Knowledge – Geographical Indications - Emerging Areas of IPR.

Law of Unfair Competition – Competition Commission.

Unit II: Copyrights and Neighboring Rights

Introduction to Copyrights – Principles of Copyright Protection – Law Relating to Copyrights - Subject Matters of Copyright – Copyright Ownership – Transfer and Duration – Right to Prepare Derivative Works – Rights of Distribution – Rights of Performers – Copyright Registration – Limitations – Infringement of Copyright – Case Law.

Unit III: Patents

Introduction to Patents - Patent Laws in India – Patent Requirements – Product Patent and Process Patent - Patent Search - Registration and Grant of Patent – Exclusive and Monopoly Rights – Limitations - Ownership - Transfer — Revocation of Patent – Patent Appellate Board - Infringement of Patent – Double Patenting — Compulsory Licensing - Patent Cooperation Treaty – New developments - Software Protection and Computer related Innovations.

Unit IV: Trademarks & Trade Secrets

Introduction to Trademarks – Trademark Laws – Functions of Trademark – Marks Covered under Trademark Law - Trade Mark Registration – Maintenance – Transfer - Deceptive Similarities - Infringement – Remedies.

Introduction to Trade Secrets – Laws Relating to Trade Secrets – Safeguarding Trade Secrets – Physical Security – Employee Access Limitation – Confidentiality Agreements – Breach of Contract – Remedies.

Unit V: Cyber Laws and Cyber Crime

Introduction to Cyber Laws – Information Technology Act 2000 - Protection of Online and Computer Transactions - E-commerce - Data Security – Privacy - Authentication - Confidentiality - Digital Signatures – Certifying Authorities - Cyber Crimes - Prevention - Punishment – Liability of Network Providers.

Texts Books:

1. Intellectual Property Rights (Patents & Cyber Law), Dr. A. Srinivas. Oxford University Press, New Delhi.
2. Deborah E.Bouchoux: Intellectual Property, Cengage Learning, New Delhi.
3. PrabhuddhaGanguli: Intellectual Property Rights, Tata Mc-Graw –Hill, New Delhi
4. Richard Stim: Intellectual Property, Cengage Learning, New Delhi.
5. Kompal Bansal &Parishit Bansal Fundamentals of IPR for Engineers, B. S. Publications (Press).
6. Cyber Law - Texts & Cases, South-Western's Special Topics Collections.
7. R.Radha Krishnan, S.Bala Subramanian: Intellectual Property Rights, Excel Books. New Delhi.
8. M.Ashok Kumar and MohdIqbal Ali: Intellectual Property Rights, Serials Pub.

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IV Year – I Semester	Skill advanced course/ soft skill course	L	T	P	C
		1	0	2	2
SC-701- PROJECT PLANNING, TOWN PLANNING,					

COURSE OBJECTIVES:

• Introducing the important codes and by-laws that will benefit young professionals
• Introducing practical knowledge in planning of smart city
• Equipping students with the professional knowledge in the design and construction procedures of various Civil Engineering projects
• Introducing the Knowledge about the existing cities including roads and metros

Project Planning and Town Planning

1. Byelaws in a smart city
2. Planning of new town
3. Planning of Satellite towns with roads
4. Study of best practices in cities like Chandigarh, Surat, Indore etc.
5. Theories of urban planning.
6. Re-planning existing cities including roads and metros

Reference Books

1) Town Planning by S.C. Rangwala and K.S. Rangwala, 31st Edition, 2021, Charotar Publishing House, India
2) Cities and Public Policy by Prasanna K Mohanty, SAGE Publications India Pvt Ltd
3) A Handbook Of Urbanization In India by Amitabh Kundu, B. N. Singh,K. C. Sivaramakrishnan, OUP India.
4) Urban Governance, Voice and Poverty in the Developing World by Nick Devas, Philip Amis, Jo Beall,
5) Ursula Grant, Diana Mitlin, Fiona Nunan and Carole Rakod, SAGE Publications India Pvt Ltd
6) Urban and Regional Development Plans Formulation And Implementation (URDPFI) Guidelines, Vol 1 and Vol 2, Ministry of Housing and urban Affairs, India, 2014.
Where We Want to Live: Reclaiming Infrastructure for a New Generation of Cities – Ryan Gravel, 2016, St. Martin's Press, USA.

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IV Year – I Semester	PROFESSIONAL ELECTIVE-III	L	T	P	C
		3	0	0	3
PE-701- III a) ADVANCED STRUCTURAL ENGINEERING					

Course Learning Objectives:

The objective of this course is to:

1. Familiarize students with the analysis and design of Raft Foundations and Retaining walls
2. Equip student with the concepts of designing different types of RCC water tanks
3. Understand concepts of flat slabs
4. Familiarize different types of Bunkers, Silos and Chimneys
5. Understand different types of transmission towers

Course Outcomes:

At the end of this course, the student will be able to

a. Design raft foundations and different types of RCC retaining walls
b. Carryout analysis and design of different types of RCC water tanks
c. Solve the problems regarding design of RCC Bunkers, Silos and Chimneys
d. Understand the concepts of prefabricated construction.

SYLLABUS:

UNIT – I

Analysis and Design of Raft Foundations – Design of RCC Retaining walls: Cantilever and Counter fort

UNIT – II

Analysis and Design of RCC Water Tanks, Circular and Rectangular types- Intze tank including staging.

UNIT – III

Analysis and Design of Flat Slabs- Direct Design and Equivalent Frame Methods- Check for Punching shear

UNIT – IV

Analysis and Design of RCC Chimney, Concepts of loading

UNIT-V

Analysis and design of Pressed Steel Tanks

TEXT BOOKS:

1. 'Reinforced Concrete Structures' Vol-2 by B. C. Punmia, Ashok Kumar Jain and Arun Kumar Jain, Laxmi, publications Pvt. Ltd., New Delhi
2. 'Reinforced Concrete Structures' by N. Subramanian, Oxford Publishers
3. 'Design Drawing of Concrete and Steel Structures' by N. Krishna Raju University Press 2005.

REFERENCES:

1. 'Essentials of Bridge Engineering' by D. Johnson Victor, Oxford and IBM publication Co., Pvt. Ltd.
2. 'Reinforced concrete design' by S. U, Pillai and D. Menon, Tata Mc.Grawhill Publishing Company

Codes: Relevant IS: codes.

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IV Year – I Semester	PROFESSIONAL ELECTIVE-III	L	T	P	C
		3	0	0	3
PE-701- III b) BRIDGE ENGINEERING					

Course Learning Objectives:
The objective of this course is to:
1. Familiarize students with different types of Bridges and IRC standards
2. Equip student with the concepts and design of Slab Bridges, T Beam Bridges, Box Culverts
3. Understand concepts of design of Plate Girder Bridges
4. Familiarize with different methods of inspection of bridges and their maintenance

Course Outcomes:
At the end of this course the student will be able to
a. Explain different types of Bridges with diagrams and Loading standards
b. Carryout analysis and design of Slab bridges, T Beam bridges, Box culvers and suggest structural detailing
c. Carryout analysis and design of Plate girder bridges
d. Organize for attending inspections and maintenance of bridges and prepare reports.

SYLLABUS:

UNIT-I
General Introduction to types of Bridges- (Slab bridges, T Beam, Arch bridges, Cable Stayed bridges, prestressed concrete bridges, Truss Bridges, Culverts) - Nomenclature- Selection of Bridge Site- Economical span- Abutments pier and end connections- types of foundations- Open, Pile, Well Foundations, Bearings – Types- Introduction to Loading standards- Railway and IRC Loading

UNIT-II
Slab bridges- Wheel load on slab- effective width method- slabs supported on two edges- cantilever slabs- dispersion length- Design of interior panel of slab- Guyon's – Massonet Method –Hendry-Jaegar Methods- Courbon's theory- Pigeaud's method

UNIT-III

T-Beam bridges- Analysis and design of various elements of bridge –Design of deck slab, longitudinal girders, Secondary beams- Reinforcement detailing

UNIT-IV
Plate Girder Bridges: Elements of plate girder and their design-web- flange- intermediate stiffener- vertical stiffeners- bearing stiffener- Splices, Design problem with detailing.

UNIT-V
Box Culverts: Loading – Analysis and Design- Reinforcement detailing.
Inspection and Maintenance of Bridges: Procedures and methods for inspection – Testing of bridges- Maintenance of Sub Structures and Superstructures- Maintenance of bearings- Maintenance

Schedules.

TEXT BOOK

1. 'Essentials of Bridge Engineering' by Johnson Victor D
2. 'Design of Bridge Structures' by T. R. Jagadeesh, M.A. Jayaram, PHI
3. 'Design of RC Structures' by B. C. Punmai, Jain & Jain, Lakshmi Publications

REFERENCES:

1. 'Design of Concrete Bridges' by Aswini, Vazirani, Ratwani
2. 'Design of Steel Structures' by B. C. Punmai, Jain & Jain, Lakshmi Publications
3. 'Design of Bridges' by Krishna Raju

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IV Year – I Semester	PROFESSIONAL ELECTIVE-III	L	T	P	C
		3	0	0	3
PE-701- III c) STRUCTURAL DYNAMICS					

Pre-Requisites: Soil Mechanics
Course Outcomes: At the end of the course, the student will be able to

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

Detailed Syllabus:

UNIT: 1
Introduction to Structural Dynamics: Fundamental objective of Dynamic analysis – Types of prescribed loadings – methods of Discretization – Formulation of the Equations of Motion.
UNIT: 2
Theory of Vibrations: Introduction – Elements of a Vibratory system – Degrees of Freedom of continuous systems - Oscillatory motion – Simple Harmonic Motion – Free Vibrations of Single Degree of Freedom (SDOF) systems – Undamped and Damped – Critical damping – Logarithmic decrement – Forced vibrations of SDOF systems – Harmonic excitation – Dynamic magnification factor – Band width

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UNIT: 3

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

UNIT: 4

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

UNIT: 5

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

TEXT BOOKS

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

REFERENCE:

1. Dynamics of Structures by Clough & Penzien 3e, Computers & Structures Inc.
2. Theory of Vibration -William T Thomson, Springer Science.
3. Mechanical Vibrations- S. S. Rao, 5e, Pearson Publications.

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IV Year – I Semester	PROFESSIONAL ELECTIVE-III	L	T	P	C
		3	0	0	3
PE-701- III d) URBAN TRANSPORTATION PLANNING					

Course Learning Objectives:
The objectives of this course are:

1. To appreciate urban transportation problems and procedures for travel demand estimation
2. To appreciate data collection techniques for OD data.
3. To estimate trip generation, trip distribution, mode choice and traffic assignment.
4. To develop alternative urban transport network plans

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

a. Estimate travel demand for an urban area
b. Plan the transportation network for a city
c. Identify the corridor and plan for providing good transportation facilities.
d. Evaluate various alternative transportation proposals

SYLLABUS:

UNIT -I

Urban Transportation Problems & Travel Demand: Urban Issues, Travel Characteristics, Evolution of Planning Process, Supply and Demand – Systems approach; Trends, Overall Planning process, Long term Vs Short term planning, Demand Function, Independent Variables, Travel Attributes, Assumptions in Demand Estimation, Sequential, and Simultaneous Approaches, Aggregate and Disaggregate Techniques.

UNIT -II

Data Collection and Inventories: Collection of data – Organisation of surveys and Analysis, Study Area, Zoning, Types and Sources of Data, Road Side Interviews, Home Interview Surveys, Commercial Vehicle Surveys, Sampling Techniques, Expansion Factors, Accuracy Checks, Use of Secondary Sources, Economic data – Income – Population – Employment – Vehicle Owner Ship.

UNIT -III

Trip Generation & Distribution: UTPS Approach, Trip Generation Analysis: Zonal Models, Category Analysis, Household Models, Trip Attraction models, Commercial Trip Rates; Trip Distribution: Growth Factor Methods, Gravity Models, Opportunity Models, Time Function Iteration Models.

UNIT -IV

Mode Choice Analysis: Mode Choice Behaviour, Competing Modes, Mode Split Curves, Aggregate and Disaggregate Approaches; Discrete Choice Analysis, Choice sets, Maximum Utility, Probabilistic Models: Binary Logit, Multinomial Logit Model – IIA property; Aggregation.

Traffic Assignment: Diversion Curves; Basic Elements of Transport Networks, Coding, Route Properties, Path Building Criteria, Skimming Tree, All-or-Nothing Assignment, Capacity Restraint Techniques, Reallocation of Assigned Volumes, Equilibrium Assignment.

UNIT -V

Corridor Identification, Plan Preparation & Evaluation: Master plans, Selection of Corridor, Corridor Identification, Corridor deficiency Analysis; Travel Forecasts to Evaluate Alternative Improvements, Impacts of New Development on Transportation Facilities. Pivot Point Analysis,

Environmental and Energy Analysis; Case studies.

TEXT BOOKS:

1. 'Introduction to Urban System Planning' by Hutchinson, B.G., McGraw Hill.
2. 'Transportation Engineering - An Introduction' by Khisty C.J., Prentice Halls
3. 'Fundamentals of Transportation Planning' by Papa Costas, Tata McGraw Hill

REFERENCES:

1. 'Urban Transportation Planning: A Decision Oriented Approach' by Mayer M and Miller E, McGraw Hill
2. 'Introduction to Transportation Planning' by Bruton M.J., Hutchinson of London.
3. 'Metropolitan Transportation Planning' by Dicky, J.W., Tata McGraw Hill
4. 'Traffic Engineering and Transportation Planning' by Kadiyali L.R., Khanna Publishers, New Delhi.

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DEPARTMENT OF CIVIL ENGINEERING

IV Year – I Semester	PROFESSIONAL ELECTIVE-IV	L	T	P	C
		3	0	0	3
PE-702- IV a). GROUND IMPROVEMENT TECHNIQUES					

Course Learning Objectives:
The objective of this course is:

1. To make the student appreciate the need for different ground improvement methods adopted for improving the properties of remolded and in-situ soils by adopting different techniques such as in situ densification and dewatering methods.
2. To make the student understand how the reinforced earth technology and soil nailing can obviate the problems posed by the conventional retaining walls.
3. To enable the students to know how geotextiles and geo synthetics can be used to improve the engineering performance of soils.
4. To make the student learn the concepts, purpose and effects of grouting.

Course Outcomes:

a. By the end of the course, the student should be able to possess the knowledge of various methods of ground improvement and their suitability to different field situations.
b. The student should be in a position to design a reinforced earth embankment and check its stability.
c. The student should know the various functions of Geo synthetics and their applications in Civil Engineering practice.
d. The student should be able to understand the concepts and applications of grouting.

SYLLABUS:

UNIT- I

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 and geo drains – stone columns.

UNIT -II

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 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 – principles – components of reinforced earth – design principles of reinforced earth walls – stability checks – soil nailing.

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UNIT- V

Geosynthetics – geotextiles – types – functions, properties and applications – geogrids, geomembranes and gabions - properties and applications.

TEXT BOOKS:

1. 'Ground Improvement Techniques' by Purus Hotham Raj, Laxmi Publications, New Delhi.
2. 'Ground Improvement Techniques' by Nihar RanjanPatro ,Vikas Publishing House (p) limited
, New Delhi.
3. 'An introduction to Soil Reinforcement and Geosynthetics' by G.L.Siva Kumar Babu, Universities Press.

REFERENCE BOOKS:

1. 'Ground Improvement' by MP Moseley, Blackie Academic and Professional, USA.
2. 'Designing with Geosynethetics' by RM Koerner , Prentice Hall

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IV Year – I Semester	PROFESSIONAL ELECTIVE-IV	L	T	P	C
		3	0	0	3
PE-702- IV (b) GEO-SPATIAL TECHNOLOGIES					

Course Objectives:

1. Understand the various spatial and non-spatial data types, and data base management techniques
2. Develop the concepts and professional skills in utility of geospatial techniques
3. Improve the working knowledge of geospatial techniques in field problems

Course Outcomes:

At the end of the course the student will be able to:

a) Understand the geospatial technology relating to the data acquiring and processing that is associated with geographic locations
b) Apply Geospatial techniques in the decision support systems useful for decision makers and community services.
c) Ability to solve the problems related to the natural resource management, environment, urban planning and Infrastructure development, etc.
d) Able to generate the thematic maps using Geospatial techniques
e) Apply the concept of Geospatial Techniques to the Civil Engineering problems

SYLLABUS

UNIT –I

Introduction – Basic concepts, socioeconomic challenges, fundamentals of geographical information systems (GIS), history of geographical information system, components of geographical information systems. Projections and Coordinate Systems – Map definitions, representations of point, line, polygon, common coordinate system, geographic coordinate system, map projections, transformations, map analysis.

UNIT –II

Data Acquisition: Data Types, Spatial, Non-Spatial (Attribute) Data, Data Format – Vector and Raster Data, Manual Digitizing, Scanner, Aerial Photographic Data, Remotely Sensed Data, Digital Data, Cartographic Database, Digital Elevation Data, Data Management, Data Storage and Maintenance, Data Compression, Data Quality and Standards, Precision, Accuracy, Error **–** Geometric errors and corrections, Radiometric errors and corrections, types of Systematic and Non-systematic errors.

UNIT –III

Data Modeling: Spatial Data Analysis, Data Retrieval Query, Simple Analysis, Recode Overlay, Vector Data Model, Raster Data Model, Digital Elevation Model, Cost and Path Analysis, Knowledge Based System, GIS Analysis and Functions, Organizing data for analysis, analysis function, maintenance and analysis of spatial data, buffer analysis, overlay analysis, transformations, conflation, edge matching and editing, maintenance and analysis of spatial and non-spatial data.

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UNIT –IV

Applications of GIS: Environmental and Natural Resource Management, Soil and Water Resources, Agriculture, Land Use Planning, Geology and Municipal Applications, Urban Planning and Project Management, GIS for decision making under Uncertainty, standard GIS packages, Introduction to Global Positioning Systems (GPS) and its applications.

UNIT – V

Introduction to Remote Sensing: General background of Remote Sensing Technology, Objectives and Limitations of Remote Sensing, Electro-Magnetic Radiation, Characteristics, Interaction with Atmosphere and Earth Surface, Remote Sensing Platforms and Sensors, Satellite Characteristics, Digital Image Processing, IRS Series and High Resolution Satellites, Remote Sensing Applications to Watershed Modeling, Environmental Modeling, Urban Planning and Management.

Textbook:

1. Demers, M.N, (2013). 'Fundamentals of Geographic Information Systems' Wiley India Pvt. Ltd.
2. Burrough, P. A., and McDonnell R. A. (1998). Principles of Geographical Information Systems.
   Oxford University Press, New York.
3. Kang-tsung Chang. (2006). Introduction to Geographical Information Systems. Tata McGraw- Hill Publishing Company Ltd., Third Edition, New Delhi.
4. George Joseph, (2013). 'Fundamentals of Remote Sensing' Universities Press.

References:

1. Sabin's F.F. Jr. (1978). Remote Sensing Principles and Interpretations. W.H. Freeman and Company, San Francisco.
2. Tor Bernhardsen. (2002). Geographical Information System. Wiley India (P) Ltd., Third Edition, New Delhi.
3. Hoffman-Wellenhof, B, et al. (1997). GPS Theory and Practice. Fourth Edition, Springer Wein, New York.
4. Lilysand T.M., and Kiefer R.W. (2002). Remote Sensing and Image Interpretation. John Wiley and Sons, Fourth Edition, New York.
5. Choudhury S., Chakrabarti, D., and Choudhury S. (2009). An Introduction to Geographic Information Technology. I.K. International Publishing House (P) Ltd, New Delhi.

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IV Year – I Semester	PROFESSIONAL ELECTIVE-IV	L	T	P	C
		3	0	0	3
PE-702- IV c) DISASTER MANAGEMENT & MITIGATION					

Course Objectives:

The objectives of the course are

1. To Understand basic concepts in Disaster Management
2. To Understand Definitions and Terminologies used in Disaster Management
3. To Understand Types and Categories of Disasters
4. To Understand the Challenges posed by Disasters
5. To understand Impacts of Disasters Key Skills

Course Outcomes:

The student will develop competencies in

a) the application of Disaster Concepts to Management
b) Analyzing Relationship between Development and Disasters.
c) Ability to understand Categories of Disasters and
d) realization of the responsibilities to society

SYLLABUS

UNIT I:

Introduction - Concepts and definitions: disaster, hazard, vulnerability, resilience, risks severity, frequency and details, capacity, impact, prevention, mitigation.

UNIT II

Disasters- Disasters classification; natural disasters (floods, draught, cyclones, volcanoes, earthquakes, tsunami, landslides, coastal erosion, soil erosion, forest fires etc.); manmade disasters (industrial pollution, artificial flooding in urban areas, nuclear radiation, chemical spills, transportation accidents, terrorist strikes, etc.); hazard and vulnerability profile of India, mountain and coastal areas, ecological fragility.

UNIT III

Disaster Impacts- Disaster impacts (environmental, physical, social, ecological, economic, political, etc.); health, psycho-social issues; demographic aspects (gender, age, special needs); hazard locations; global and national disaster trends; climate change and urban disasters.

UNIT IV

Disaster Risk Reduction (DRR) - Disaster management cycle – its phases; prevention, mitigation, preparedness, relief and recovery; structural and non-structural measures; risk analysis, vulnerability and capacity assessment; early warning systems, Post disaster environmental response (water, sanitation, food safety, waste management, disease control,

security, communications); Roles and responsibilities of government, community, local institutions, NGOs and other stakeholders; Policies and legislation for disaster risk reduction, DRR programs in India and the activities of National Disaster Management Authority.

UNIT V

Disasters, Environment and Development- Factors affecting vulnerability such as impact of developmental projects and environmental modifications (including of dams, land use changes, urbanization etc.), sustainable and environmental friendly recovery; reconstruction and development methods.

Text Books:

1. Pradeep Sahni, 2004, Disaster Risk Reduction in South Asia, Prentice Hall.
2. Singh B.K., 2008, Handbook of Disaster Management: Techniques & Guidelines, Rajat Publication.
3. Ghosh G.K., 2006, Disaster Management, APH Publishing Corporation

Reference Books:

1. http://ndma.gov.in/ (Home page of National Disaster Management Authority)
2. http://www.ndmindia.nic.in/ (National Disaster management in India, Ministry of Home Affairs).
3. Disaster Medical Systems Guidelines. Emergency Medical Services Authority, State of California, EMSA no.214, June 2003
4. Inter-Agency Standing Committee (IASC) (Feb. 2007). IASC Guidelines on Mental Health and Psychosocial Support in Emergency Settings. Geneva: IASC

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IV Year – I Semester	PROFESSIONAL ELECTIVE-IV	L	T	P	C
		3	0	0	3
PE-702- IV d). SOIL DYNAMICS AND MACHINE FOUNDATIONS					

Course Learning Objectives:

The basic course in soil mechanics/geotechnical engineering generally introduces the fundamental concepts, principles and applications of soil as engineering material with properties under static loading.

This course on 'Soil Dynamics' discusses

1. To calculate the fundamental vibration parameters.
2. To analyze the vibrations of machine foundations.
3. To determine the dynamic properties of soils.
4. To decide the suitable type of machine foundation and its design aspects.
5. To select the suitable vibration isolation method for machine foundations and liquefaction mitigation methods.

Course Outcomes:

On successful completion of these course, the student able to

a. Use theory of vibrations to find the behavior of soil under dynamic loading.
b. Design machine foundations under different loads and soil conditions.
c. Understand the liquefaction phenomena.
d. Conduct various laboratory and filed tests to determine the dynamic soil prosperities and its interpretation.
e. Design vibration isolators under any vibratory machines.

SYLLABUS:

UNIT-I

Introduction: Types of motion- SHM- Fundamental definitions- SDOF systems- Free and forced vibration with and without damping - Constant force and rotating mass type excitation –Types of damping-Equivalent stiffness of springs in series and parallel. – Resonance and its effect - magnification-logarithmic decrement –Transmissibility.

UNIT-II

Theories of Vibration Analysis- EHS Theory and lumped parameter model- Different modes of vibration- Natural frequency of foundation soil system – Barkan and IS methods – Pressure bulb concept – Reisner Theory – Limitations of Reisner theory – Sung's solutions -- Pauw's Analogy – Heigh's Theory.

UNIT-III

Dynamic properties of soils, Determination of E, G and Poisons ratio from field and laboratory tests, recommendations of Indian codes- Stress waves in bounded elastic medium- Use of wave theory in the determination of elastic properties, Elastic coefficients of soils and their determination- damping factor from free and forced vibration tests.– Block vibration test – Determination of Damping factor.

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UNIT-IV

Types of machine foundations – general requirements design – criteria for machine foundations, permissible amplitudes and bearing pressure, Design data, design criteria, IS code provisions for the design foundations of reciprocating machines.

Design data, design criteria, IS code provisions for the design foundations of Impact type of machines.

UNIT-V

Vibration Isolation: Transmissibility, Principles of isolation- Methods of isolation- Vibration isolators- Types and their characterizes

Special Topics: Liquefaction of soils, CSR, CRR, Factor of safety against liquefaction - Dynamic bearing capacity, Earth retaining structures under dynamic loads

TEXT BOOK:

1. 'Vibrations of Soils and Foundations' by Richart Hall and Woods

REFERENCES:

1. 'Vibration Analysis and Foundation Dynamics' by NSV Kameswara Rao, Wheeler Publishing, New Delhi.
2. 'Foundations of Machines- Analysis and Design' by Prakash and Puri

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IV Year – I Semester	PROFESSIONAL ELECTIVE-V	L	T	P	C
		3	0	0	3
PE-703- V a) DESIGN AND DRAWING OF IRRIGATION STRUCTURES					

Course Learning Objectives:
The course is designed to make the students learn the hydraulic design principles of irrigation structures.

Course Outcomes:
At the end of the course the student will be able to understand, design and draw hydraulic structures of
1. Surplus weir
2. Tank sluice with a tower head
3. Canal drop-Notch type
4. Canal regulator
5. Syphon aqueduct type III

SYLLABUS:
Design and drawing of
1. Surplus weir
2. Tank sluice with a tower head
3. Canal drop-Notch type
4. Canal regulator
5. Syphon aqueduct type III

Final Examination pattern: Any two question of the above five designs may be asked out of which the candidated has to answer one question. The duration of the examination is three hours.

TEXT BOOKS:
1. Water Resources Engineering – Principles and Practice by C. Satyanarayana Murthy, New age International Publishers.

REFERENCE BOOKS:
1. Irrigation Engineering and Hydraulic Structures by S.K. Garg, Standard Book House.
2. Irrigation and Water Power Engineering by B.C Punmia & Lal, Lakshmi Publications pvt. Ltd., New Delhi.

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IV Year – I Semester	PROFESSIONAL ELECTIVE-V	L	T	P	C
		3	0	0	3
PE-703- V b). EARTH & ROCKFILL DAMS					

Course Objectives:

1. Suitability of materials for earth and rock fill dams
2. Causes of failures
3. To determine

slope stability **Course**

Outcomes:

a) Able to design earth and rock fill dams
b) Get familiarity with slope stability calculations,
c) Prevention techniques for slope failures

SYLLABUS

Unit-I:
Earth and Rock fill Dams: General features, Selection of site; Merits and demerits of the earth and rock fill dams, Classification of earth dams, Materials of construction and requirements, Causes of failure, Safe design criteria. Instrumentation in earth dams: Pore pressure measurements, Settlement gauges, Inclinometers, Stress measurements, Seismic measurements.

Unit-II:
Failures, Damages and Protection of Earth Dams: Nature and importance of failure, piping through embankment and foundations, Methods of seepage control through embankments and foundations, Design Criteria for filters, Treatment of upstream and downstream of slopes, Drainage control, Filter design.

Unit-III:
Slope Stability Analysis: Types of Failure: Failure surfaces – Planar surfaces, Circular surfaces, Non- circular surfaces, Limit equilibrium methods, Total stress analysis versus effective Stress analysis, Use of Bishop's pore pressure parameters, Short term and Long term stability in slopes.

Unit-IV:
Methods of Slope Stability: Taylor Charts, Method of Slices, Effect of Tension Cracks, Vertical Cuts. Bishop's Analysis, Bishop and Morgenstern Analysis, Non-circular Failure

Surfaces: Morgenstern and Price Analysis, Janbu Analysis, Spencer Analysis, Sliding Block Analysis, Seismic stability, Stabilization of slopes: Drainage measures, Soil reinforcement (geosynthetics/soil nailing/micro piles etc.), soil treatment (cement/lime/thermal treatment), surface protection (vegetation/erosion control mats/concrete).

Unit-V:

Rock fill Dams: Requirements of compacted rock fill, Shear strength of rock fill, Rock fill mixtures, Rock fill embankments, Earth-core Rock fill dams, Stability, Upstream & Downstream slopes.

TEXT BOOKS:

1. Christian, K. Earth & Rock fill Dams – Principles of Design and Construction, CRC Press, 1997.
2. Sowers, G.F. – Earth and Rock fill Dam Engineering, Asia Publishing House, 1962.

REFERENCES:

1. Bharat Singh and Sharma, H. D. – Earth and Rock fill Dams, 1999
2. Abramson, L. W., Lee, T. S. and Sharma, S. – Slope Stability and Stabilisation methods – John Wiley & sons. (2002)
3. Sherard, Woodward, Gizienski and Clevenger. Earth and Earth-Rock Dams. John Wiley &. Sons. 1963.
4. US Army Corp of Engineers, Earth and Rock-fill Dams, General Design and construction Considerations, University Press of the Pacific (2004)
5. Bromhead, E. N. (1992). The Stability of Slopes, Blackie academic and professional, London.

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IV Year – I Semester	PROFESSIONAL ELECTIVE-V	L	T	P	C
		3	0	0	3
PE-703- V c). URBAN HYDROLOGY					

Course Learning Objectives:
The course is designed to:

- appreciate the impact of urbanization on catchment hydrology
- Understand the importance of short duration rainfall runoff data for urban hydrology studies.
- Learn the techniques for peak flow estimation for storm water drainage system design.
- understand the concepts in design of various components of urban drainage systems
- Learn some of the best management practices in urban drainage.
- understand the concepts of preparation master urban drainage system

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

- develop intensity duration frequency curves for urban drainage systems
- Develop design storms to size the various components of drainage systems.
- Apply best management practices to manage urban flooding.
- Prepare master drainage plan for an urbanized area.

SYLLABUS:

UNIT I

Introduction: Urbanization and its effect on water cycle – urban hydrologic cycle – trends in urbanization – Effect of urbanization on hydrology

Precipitation Analysis: Importance of short duration of rainfall and runoff data, methods of estimation of time of concentration for design of urban drainage systems, Intensity-Duration - Frequency (IDF) curves, design storms for urban drainage systems.

UNIT II
Approaches to urban drainage: Time of concentration, peak flow estimation approaches, rational method, NRCS curve number approach, runoff quantity and quality, wastewater and storm water reuse, major and minor systems.

UNIT III
Elements of drainage systems: Open channel, underground drains, appurtenances, pumping, and source control.

UNIT IV
Analysis and Management: Storm water drainage structures, design of storm water

network- Best Management Practices–detention and retention facilities, swales, constructed wetlands, models available for storm water management.

UNIT V

Master drainage plans: Issues to be concentrated upon – typical urban drainage master plan, interrelation between water resources investigation and urban planning processes, planning objectives, comprehensive planning, and use of models in planning

Text Books:

1. GeigerW.F, JMarsalek, W.J.RawlsandF.

C. Zuidema, (1987 - 2 volumes), UNESCO, Manualon Drainage in Urbanized area

2. Hall M J (1984), Elsevier Applied Science Publisher. Urban Hydrology
3. Wanielista M P and Eaglin (1997), Wiley and Sons, Hydrology – Quantity and Quality Analysis,
4. Akan A.O and R.L. Houghtalen (2006), Wiley International, Urban Hydrology, Hydraulics and Storm water Quality: Engineering Applications and Computer Modelling,

References:

1. Storm water Detention for Drainage, Stahre P and Urbonas B (1990), Water Quality and CSO Management, Prentice Hall.
2. Urban water cycle processes and interactions, Marsalek et. al. (2006), Publication No. 78, UNESCO,Paris(http://www.bvsde.paho.org/bvsacd/cd63/149460E.pdf)
3. Frontiers in Urban Water Management – Deadlock or Hope, by Maksimovic C and J A Tejada-Guibert (2001), IWAPublishing

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OE- I/III	OPEN ELECTIVE	L	T	P	C
		3	0	0	3
(a) STRENGTH OF MATERIALS					

Course Learning Objectives:

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.

To give concepts of stresses developed in the cross section and bending equations calculation of section modulus of sections with different cross sections.

The concepts above will be utilized in measuring deflections in beams under various loading and support conditions.

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:

The student will be able to understand the basic materials behaviour under the influence of different external loading conditions and the support conditions.

The student will be able to draw the diagrams indicating the variation of the key performance features like bending moment and shear forces.

The student will have knowledge of bending concepts and calculation of section modulus and for determination of stresses developed in the beams and deflections due to various loading conditions.

The student will be able to assess stresses across section of the thin and thick cylinders to arrive at optimum sections to withstand the internal pressure using Lame's equation.

SYLLABUS:

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 like rectangular, 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.

TEXTBOOKS:

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

Strength of materials by R. K. Bansal, Lakshmi Publications.

REFERENCES:

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
4. Mechanics of Structures Vol – I by H.J. Shah and S.B. Junnarkar, Charotar Publishing House Pvt.

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		L	T	P	C
OE- I/III	**OPEN ELECTIVE**	**3**	**0**	**0**	**3**

(b) FLUID MECHANICS

Course Learning Objectives:

The course is designed to make the students,

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

Course Outcomes:

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

1. Understand the various properties of fluids and their influence on fluid motion and analyze a variety of problems in fluid statics and dynamics.
2. Calculate the forces that act on submerged planes and curves.
3. Analyse various types of flow problems through closed conduits.
4. Measure the quantities of fluid flowing in pipes and channels.
5. Understand the concepts of Boundary layer and solve problems on boundary layer.

SYLLABUS:

UNIT I:

Introduction: 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 – Center of pressure.

UNIT – II:

Fluid Kinematics: Description of fluid flow, Streamline, path line and streak line and stream tube. Classification of flows: Steady, unsteady, uniform, non-uniform, laminar, turbulent, rotational and ir-rotational 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 streamline - 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-William's 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.

Textbooks:

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

References:

K. Subramanian, Fluid mechanics and hydraulic machines Mc graw hill education, II edition
Fluid Mechanics and Machinery, C.S.P. Ojha, R. Berndtsson and P.N. Chandramouli, Oxford Higher Education. Principle of fluid mechanics and fluid machines III edition, university press

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OE- I/III	OPEN ELECTIVE	L	T	P	C
		3	0	0	3
(c) SURVEYING & GEOMATICS					

Course Outcomes:
At the end of this course the student will be able to
1. Describe the function of surveying and work with survey instruments, take observations, and prepare plan, profile, and cross-section and perform calculations.
2. Calculate, design and layout horizontal and vertical curves.
3. Operate a total station and GPS to measure distance, angles, and to calculate differences in Elevation. Reduce data for application in a geographic information system.
4. Relate and apply principles of photogrammetry for surveying.
5. Apply principles of Remote Sensing and Digital Image Processing for Civil Engineering problems.

SYLLABUS:

UNIT - I

Introduction to Surveying: Definition, Classification, Principles, Survey stations and Survey lines; Introduction to measurement of distance, direction and elevation; Ranging and it methods, Meridians and Bearings, Methods of levelling, Booking and reducing levels, Reciprocal levelling, distance of visible horizon, Profile levelling and cross sectioning, Errors in levelling; Introduction to methods of plane table surveying; Contouring: Characteristics, methods, uses, computation of areas and volumes. Theodolite survey: Instruments, Measurement of horizontal and vertical angle; Methods of horizontal and vertical control, Triangulation: Figures or systems, Signals, Satellite station, Baseline and its importance, corrections, Trigonometric levelling: Accessible and inaccessible objects. [8 Hours]

UNIT - II

Curves: Elements of simple circular curves, Theory and methods of setting out simple circular curves, Transition curves- types, characteristics and equations of various transition curves; Introduction to vertical curves. [8 Hours]

UNIT - III

Modern Field Survey Systems: Principle and types of Electronic Distance Measurement systems and instruments, Total Station- its advantages and applications; Global Positioning Systems Segments, working principle, errors and biases. Geographic Information System: Concepts and data types, data models, data acquisition. GIS applications in civil engineering. [8 Hours]

UNIT - IV

Photogrammetric Survey: basic principles, aerial camera, scale of a vertical photograph, relief displacement of a vertical photograph, height of object from relief displacement, flight planning for aerial photography, selection of altitude, interval between exposures, crab and drift, stereoscope and stereoscopic views, parallax equations. Introduction to digital photogrammetry.
[8 Hours]

UNIT - V

Remote Sensing: Concepts and physical basis of Remote Sensing, Electromagnetic spectrum, atmospheric effects, image characteristics. Remote sensing systems, spectral signatures and characteristics spectral reflectance curves. Salient features of some of Remote Sensing satellites missions. Digital image processing: Introduction, image rectification and restoration, image enhancement, image transformation, image classification. Applications of remote sensing to civil engineering. [8 Hours]

Books and References:

1. Madhu, N, Sathikumar, R and Satheesh Gobi, Advanced Surveying: Total Station, GIS and Remote Sensing, Pearson India, 2006.
2. Manoj, K. Arora and Badjatia, Geomatics Engineering, Nem Chand & Bros, 2011
3. Bhavikatti, S.S., Surveying and Levelling, Vol. I and II, I.K. International, 2010
4. Chandra, A.M., Higher Surveying, Third Edition, New Age International (P) Limited, 2002.
5. Anji Reddy, M., Remote sensing and Geographical information system, B.S. Publications, 2001.
6. Arora, K.R., Surveying, Vol-I, II and III, Standard Book House.
7. Punmia BC et al: Surveying Vol. I, II, Laxmi Publication
8. Chandra AM and Ghosh SK: Remote Sensing and Geographical Information System, Alpha Science
9. Ghosh SK: Digital Image Processing, Alpha Science
10. Lillesand T M et al: Remote Sensing & Image Interpretation, John Wiley & Sons
11. Bhatta B: Remote Sensing and GIS, Oxford University Press, 2008

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d) HIGHWAY ENGINEERING

Course Learning Objectives:
The objectives of this course are:
- 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 the successful completion of this course, the students will be able to:
1. Plan highway network for a given area.
2. Determine Highway alignment and design highway geometrics.
3. Design Intersections and prepare traffic management plans.
4. Judge suitability of pavement materials and design flexible and rigid pavements

SYLLABUS:
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.

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

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REFERENCES:

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

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e). ROAD SAFETY ENGINEERING

Course Objectives:

1. This module on the fundamental of traffic engineering & some of the statistics methods to analysis the traffic safety.
2. The accident interrogations & risk involved with measures to identity the causes are dealt.
3. The role of road safety in planning the urban infrastructures design is discussed.
4. The various traffic management systems for safety & safety improvement strategies are dealt.

Course Outcomes:

At the end of the course, students will be able to

a) To understand fundamental of Traffic Engineering
b) To investigate & determine the collective factors & remedies of accident involved.
c) To design & planning various road geometrics.
d) To massage the traffic system from road safety point of view.

SYLLABUS

UNIT I:
Introduction to Road Safety:
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.

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TEXT BOOKS:

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

REFERENCES:

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

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(f) ENVIRONMENTAL MANAGEMENT					

Course Learning Objectives:
The course will address the following:

1. Outline planning and the design of water supply systems for a community/town/city
2. Provide knowledge of air pollution control with various methods
3. Impart understanding of importance of protection of water source quality and enlightens the efforts involved in converting raw water into clean potable water.
4. Selection of valves and fixture in water distribution systems
5. Impart knowledge on Industrial Wastewater management
6. Visit at least one Water and Wastewater Treatment Plant and supply system.

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

a. Plan and design the water and wastewater systems
b. Identify the source of emissions and select proper control systems
c. Design & estimation of water supply system for a city
d. to get knowledge about various environmental aspects
e. Selection of suitable treatment flow for raw water treatments

SYLLABUS:
UNIT I
Energy and Environment: Definition- Energy demand – Energy resources and generation of electricity – conservation and management of energy resources – Oil pollution – Impact of oil pollution on marine and costal ecosystems – Management of oil pollution - case study of oil pollution.

UNIT II
Agriculture and Environment: Definition -Composition of soils **–** soils for plant growth **–** difference between sandy and clayey soils **–** macro and micro nutrients for plant growth – different types of agriculture – Impact of agriculture on environment and people – causes for soil erosion – management of soil erosion

UNIT III
Water Management: Water cycle – global water distribution – fresh water supply system – water usage in different ways – water quality and availability - water pollution and its sources – impact of water pollution – managing pollution of fresh water – managing water related diseases.
UNIT IV
Atmospheric Pollution: Definition – atmosphere – structure and composition of atmosphere – natural greenhouse effect – atmospheric pollution and its causes like smog, acid rain – ozone layer depletion – enhanced greenhouse effect – urban heat islands – impact of atmospheric pollution on humans, plants – managing of atmospheric pollution.

UNIT V
Management of natural hazards: definition – hazard and disaster – Earth quake and volcanoes – Flooding – drought – impact of natural hazards – managing the impacts of natural hazards – opportunities presented by natural hazards.
Text Books:

1. KVSG Murali Krishna, “Environmental studies”, VGS Publications, Vijayawada, 2016.
2. Jacobson, M.Z. “Atmospheric Pollution: History, Science and Regulation”, Cambridge University Press.

3. Masters, G.M. "Introduction to Environmental Engineering and Science", PHI.

.References:

1. Jacobson, M.Z. "Fundamental of Atmospheric Modeling", Cambridge University Press.

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(g) URBAN PLANNING					

Course Learning Objectives:
The objectives of this course are:

1 To appreciate urban transportation problems and procedures for travel demand estimation
2 To appreciate data collection techniques for OD data.
3 To estimate trip generation, trip distribution, mode choice and traffic assignment.
4 To develop alternative urban transport network plans

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

A Estimate travel demand for an urban area
B Plan the transportation network for a city
C Identify the corridor and plan for providing good transportation facilities.
D Evaluate various alternative transportation proposals

SYLLABUS:

UNIT -I

Urban Transportation Problems & Travel Demand: Urban Issues, Travel Characteristics, Evolution of Planning Process, Supply and Demand – Systems approach; Trends, Overall Planning process, Long term Vs Short term planning, Demand Function, Independent Variables, Travel Attributes, Assumptions in Demand Estimation, Sequential, and Simultaneous Approaches, Aggregate and Disaggregate Techniques.

UNIT -II

Data Collection and Inventories: Collection of data – Organisation of surveys and Analysis, Study Area, Zoning, Types and Sources of Data, Road Side Interviews, Home Interview Surveys, Commercial Vehicle Surveys, Sampling Techniques, Expansion Factors, Accuracy Checks, Use of Secondary Sources, Economic data – Income – Population – Employment – Vehicle Owner Ship.

UNIT -III

Trip Generation & Distribution: UTPS Approach, Trip Generation Analysis: Zonal Models, Category Analysis, Household Models, Trip Attraction models, Commercial Trip Rates; Trip Distribution: Growth Factor Methods, Gravity Models, Opportunity Models, Time Function Iteration Models.

UNIT -IV

Mode Choice Analysis: Mode Choice Behaviour, Competing Modes, Mode Split Curves, Aggregate and Disaggregate Approaches; Discrete Choice Analysis, Choice sets, Maximum Utility, Probabilistic Models: Binary Logit, Multinomial Logit Model – IIA property; Aggregation.

Traffic Assignment: Diversion Curves; Basic Elements of Transport Networks, Coding, Route Properties, Path Building Criteria, Skimming Tree, All-or-Nothing Assignment, Capacity Restraint Techniques, Reallocation of Assigned Volumes, Equilibrium Assignment.

UNIT -V

Corridor Identification, Plan Preparation & Evaluation: Master plans, Selection of Corridor, Corridor Identification, Corridor deficiency Analysis; Travel Forecasts to Evaluate Alternative Improvements, Impacts of New Development on Transportation Facilities. Pivot Point Analysis, Environmental and Energy Analysis; Case studies.

TEXT BOOKS:

1 'Introduction to Urban System Planning' by Hutchinson, B.G., McGraw Hill.

2 'Transportation Engineering - An Introduction' by Khisty C.J., Prentice Halls

3 'Fundamentals of Transportation Planning' by Papa Costas, Tata McGraw Hill

REFERENCES:

1 'Urban Transportation Planning: A Decision Oriented Approach' by Mayer M and Miller E, McGraw Hill

2 'Introduction to Transportation Planning' by Bruton M.J., Hutchinson of London.

3 'Metropolitan Transportation Planning' by Dicky, J.W., Tata McGraw Hill

4 'Traffic Engineering and Transportation Planning' by Kadiyali L.R., Khanna Publishers, New Delhi.

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(a) ELEMENTS OF CIVIL ENGINEERING					

COURSE OBJECTIVES:

The objectives of this course are to make students to learn about

1. basics of Civil Engineering concepts
2. the surveying, elevations and mapping
3. the construction materials and elements
4. water resource development

COURSE OUTCOMES:

At the end of the course the student is familiar

a) basics of Civil Engineering concepts
b) the surveying the elevations and mapping
c) the construction materials and elements
d) water resource development and
e) overall infrastructure development

SYLLABUS:

Unit-I:

Scope of Civil Engineering: Introduction: Impact of Infrastructural Development on the Economy of a Country, Role of Civil Engineers, Importance of Planning, Scheduling and Construction Management.

Surveying:

Introduction: Surveying and leveling, object and uses, Primary divisions, Fundamental principles, Classification of surveying, Plans and maps, Scales, Units of measure.

Unit II:

Compass surveying:

Types and uses of compass, Bearings, Whole Circle Bearings, and Reduced Bearings, Computation of angles; Meridians; declinations and dip of needle.

Elevation measurements:

Leveling, object and uses, terms used in leveling, leveling instruments, methods of leveling.

Unit -III:

Construction Materials:

Requirement, types, uses, properties and importance of Civil Engineering materials like Stone, Bricks, Lime, Cement, Ferrous and Non Ferrous Metals, Ceramic Materials, Timber, Sand, Aggregate, Mortar and Concrete, Paints and Varnishes, Glass and Plastic.

Unit -IV:

Planning:

Elementary principles and basic requirements of a building planning, layout of residential & industrial buildings.

Construction:

Classification of buildings based upon occupancy and structure, Design Loads, Common building components, their functions, and nominal dimensions. Elements of building drawing. Introduction to building byelaws.

Unit –V:

Water Resources Development

Elementary Hydrology, Sources of water, Watershed Development, water requirements and its conservation, Hydraulic Structures of Storage.

Books:

1. Surveying Vol. I&II, Dr. B. C Punamia Laxmi Publications, Delhi
2. Building Construction, Dr. B. C Punamia Laxmi Publications, Delhi
3. Engineering Materials, Dr. S. C Rangwal, Charotar Pub, House
4. Irrigation Engineering and Hydraulics Structures, Santosh Kumar Garg: Khanna Publishers Delhi.
5. Civil Engineering Materials, Jakson and Dhir, ELBS Publishing London
6. Civil Engineering Drawing, S.C Rangwal, Charotar Pub, House Anand.
7. Elements of Civil Engineering (IV Edition) by S.S. Bhavikatti, New Age International Publisher, New Delhi, 3rd edition

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(b) ENVIRONMENTAL ENGINEERING					

Course Learning Objectives:
The course will address the following:

1 Outline planning and the design of water supply systems for a community/town/city
2 Provide knowledge of water quality requirement for domestic usage
3 Impart understanding of importance of protection of water source quality and enlightens the efforts involved in converting raw water into clean potable water.
4 Selection of valves and fixture in water distribution systems
5 Impart knowledge on design of water distribution network
6 Visit at least one Water Treatment Plant and supply system.

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

A Plan and design the water and distribution networks and sewerage systems
B Identify the water source and select proper intake structure
C Design & estimation of water supply system of an apartment
D Select the appropriate appurtenances in the water supply
E Selection of suitable treatment flow for raw water treatments

SYLLABUS:

UNIT–I

Introduction: Importance and Necessity of Protected Water Supply systems, Water borne diseases, Planning of public water supply system, components of public water supply systems. Per capita demand and factors influencing it, types of water demands and its variations, factors affecting water demand, Design Period, Factors affecting the Design period, estimation of water demand for a town or city, Population Forecasting.

UNIT-II

Sources of Water: Various surface and subsurface sources considered for water supply and their comparison-Capacity of storage reservoirs, Types of subsurface water bearing formations, Yields from wells and infiltration galleries. Conveyance of Water from the source to the point of interest: Gravity and Pressure conduits, Types of Pipes, Pipe Materials, selection of pipe materials, Pipe joints.

UNIT-III

Quality and Analysis of Water: Characteristics of water and their measurement or estimation or analysis: Physical, Chemical and Biological characteristics. Water quality criteria for different uses- Rural, Municipal, Industrial and Agricultural uses. Drinking water quality standards: IS and WHO guidelines.

UNIT-IV

Treatment of Water: Typical treatment flow of a municipal water treatment plant, Unit operations of water treatment: Theory and Design of Sedimentation, Coagulation, flocculation, Filtration, Water conditioning and softening, Disinfection, Removal of color and odours – Removal of Iron and manganese – Fluoridation and deflouridation –Ion Exchange - Ultra filtration- Reverse Osmosis.

UNIT–V

Distribution of Water: Requirements- Methods of Distribution system, Layouts of Distribution networks, Pressures in the distribution layouts, Analysis of Distribution networks: Hardy Cross and equivalent pipe methods – Appurtenances of water distribution system–Laying and testing of pipe lines. Ideal water supply system.

TEXT BOOKS

1. Environmental Engineering – Howard S. Peavey, Donald R. Rowe, Teorge George Tchobanoglus – Mc-Graw-Hill Book Company, New Delhi, 1985.
2. Water Supply Engineering. Dr. P.N. Modi, Standard Book House, Delhi.
3. Rural, Municipal and Industrial Water management, KVSG Murali Krishna, Reem Publications, New Delhi, 2012

REFERENCES

1. Elements of Environmental Engineering – K.N. Duggal, S. Chand & Company Ltd., New Delhi.
2. Water Supply Engineering. – Dr. B.C. Punmia, A.K. Jain and A.K. Jain. Laxmi Publications (P) Ltd., New Delhi.
3. Water Supply and Sanitary Engineering – G.S.Birdie and J.S.Birdie

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(c) DISASTER MANAGEMENT					

Course Learning Objectives:
The objective of this course is:

1. Develop an understanding of why and how the modern disaster manager is involved with pre-disaster and post-disaster activities.
2. Develop an awareness of the chronological phases of natural disaster response and refugee relief operations. Understand how the phases of each are parallel and how they differ.
3. Understand the 'relief system' and the 'disaster victim.'
4. Describe the three planning strategies useful in mitigation.
5. Identify the regulatory controls used in hazard management.
6. Describe public awareness and economic incentive possibilities.
7. Understand the tools of post-disaster management.

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

a. Affirm the usefulness of integrating management principles in disaster mitigation work
b. Distinguish between the different approaches needed to manage pre- during and post- disaster periods
c. Explain the process of risk management
d. Relate to risk transfer

SYLLABUS:

UNIT-I

Natural Hazards and Disaster Management: Introduction of DM – Inter disciplinary nature of the subject– Disaster Management cycle – Five priorities for action. Case study methods of the following: Vegetal Cover floods, droughts – Earthquakes – landslides – global warming, cyclones & Tsunamis – Post Tsunami hazards along the Indian coast.

UNIT-II

Man Made Disaster and Their Management Along With Case Study Methods Of The Following: Fire hazards – transport hazard dynamics – solid waste management – post disaster – bio terrorism -threat in mega cities, rail and aircraft accidents, ground water, industries - Emerging infectious diseases and Aids and their management.

UNIT-III

Risk and Vulnerability: Building codes and land use planning – Social Vulnerability – Environmental vulnerability – Macro-economic management and sustainable development, Climate change risk rendition – Financial management of disaster – related losses.

UNIT-IV

Role of Technology in Disaster Managements: Disaster management for infra structures, taxonomy of infra structure – treatment plants and process facilities-electrical substations- roads and bridges-mitigation programme for earth quakes – flowchart, geospatial information in agriculture drought assessment - Multimedia Technology in disaster risk management and training - Transformable Indigenous Knowledge in disaster reduction – Role of RS & GIS.

UNIT-V

Multi-sectional Issues, Education and Community Preparedness: Impact of disaster on poverty and deprivation - Climate change adaptation and human health - Exposure, health hazards and environmental risk-Forest management and disaster risk reduction -The Red cross and red crescent movement - Corporate sector and disaster risk reduction- Education in disaster risk reduction- Essentials of school disaster education - Community capacity and disaster resilience-Community based disaster recovery - Community based disaster management and social capital-Designing resilience- building community capacity for action.

TEXT BOOKS:

1. An Introduction of Disaster Management- Natural Disasters & Vulnerable Hazards– S.Vaidyanathan: CBS Punblishers & Distributors Pvt. Ltd.
2. Natural Hazards & Disaster Management, Vulnerability and Mitigation by RB Singh- Rawat Publications
3. 'Disaster Science & Management' by Tushar Bhattacharya, Tata McGraw Hill Education Pvt. Ltd., New Delhi.
4. 'Disaster Management – Future Challenges and Opportunities' by Jagbir Singh (2007), I K International Publishing House Pvt. Ltd.

REFERENCE BOOKS:

1. 'Disaster Management' edited by H K Gupta (2003), Universities press.
2. 'Disaster Management – Global Challenges and Local Solutions' by Rajib shah & R R Krishnamurthy (2009), Universities press.
3. R. Nishith, Singh AK, "Disaster Management in India : Perspectives, Issues and strategies" New Royal Book Company."

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(d) WATER RESOURCES ENGINEERING					

Course Learning Objectives:
The course is designed to make the students,
1 Estimate irrigation water requirements.
2 Design irrigation canals
3 Understand hydrologic cycle and its relevance to Civil engineering.
4 Learn physical processes and their interactions in hydrology.
5 Learn measurement and estimation of the components of hydrologic cycle.
5 Have an overview and understanding of Hydrographs.

Course Outcomes:
At the end of the course the students are expected to
A Have a thorough understanding of the theories and principles governing the hydrologic processes.
B Be able to quantify hydrologic components and apply concepts in hydrologic design of water resources projects.
C Develop Intensity-Duration-Frequency and Depth-Area Duration curves to design hydraulic structures.
D Develop design storms and carry out frequency analysis.
E Develop flow mass curve and flow duration curve, apply hydrograph analysis in the design of water resources projects.
F Develop unit hydrograph and synthetic hydrograph.

SYLLABUS:

UNIT – I
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.

UNIT-II
Canals: Classification, design of non-erodible canals - methods of economic section and maximum permissible velocity, economics of canal lining, design of erodible canals -Kennedy's silt theory and Lacey's regime theory, balancing depth of cutting.
Diversion Head Works: Types of diversion head works, weirs and barrages, layout of diversion head works, components. Causes and failures of weirs on permeable foundations, Bligh's creep theory, Khosla's theory, design of impervious floors for subsurface flow, exit gradient.

UNIT-III
Introduction: Engineering hydrology and its applications, Hydrologic cycle, hydrological data-sources of data.
Precipitation: Types and forms, measurement, introduction to radar measurement of rain fall, 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-IV

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

Runoff: Factors affecting runoff, components, empirical formulae, tables and curves, stream gauging, rating curve, flow mass curve and flow duration curve.

UNIT-V

Hydrograph analysis: 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, dimensionless unit hydrograph, synthetic unit hydrograph, introduction to IUH.

TEXTBOOKS:

1 'Irrigation and Waterpower Engineering' by Punmia B C, P.B.B Lal, A.K. Jain and A.K. Jain (2009), Laxmi Publications Pvt. Ltd., New Delhi
2 'Irrigation Water Resources and Waterpower Engineering' by Modi P N (2011), Standard Book House, New Delhi
3 'Engineering Hydrology' by Subramanya, K, Tata McGraw-Hill Education Pvt Ltd, (2013), New Delhi.
4 'Engineering Hydrology' by Jayarami Reddy, P, Laxmi Publications Pvt. Ltd., (2013), New Delhi
5 'Water Resources Engineering', Mays L.W, Wiley India Pvt. Ltd, (2013).
6 'Hydrology and Water Resources Engineering' by Patra K.C., Narosa Publications, (2011).

REFERENCES:

1 'Water Resources Engineering' by Mays L.W (2013), Wiley India Pvt. Ltd, New Delhi.
2 'Irrigation Engineering' by Sharma R.K. and Sharma, T. K (2012), S. Chand & Co Publishers.
3 'Water Resources Engineering' by Satyanarayana Murthy Challa (2008), New Age International Publishers.

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(e) HYDRAULICS AND HYDRAULIC MACHINERY					

Course Learning Objectives:

- To study about uniform and non-uniform flows in open channels
- 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 this course the students will be able to:

- Solve uniform and non-uniform open channel flow problems.
- Apply the principals of dimensional analysis and similitude in hydraulic model testing.
- Select suitable pumps and turbines.

SYLLABUS:

UNIT – I:

UNIFORM FLOW IN OPEN CHANNELS:

Types of channels –Types of flows - Velocity distribution – Energy and momentumcorrection factors – Chezy's and Manning's formulae for uniform flow – Most Economicalsections, Critical flow: Specific energy-critical depth – computation of critical depth

UNIT II:
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 – III:
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 – IV:
IMPACT OF JETS:
Hydrodynamic force of jets on stationary and moving flat, inclinedand curved vanes, jet striking centrally and at tip, velocity triangles at inlet and outlet, expressions for work done and efficiency-Angular momentum principle.
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.

UNIT – V:
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 diagrams, 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.

Text Books:

1. Open Channel flow, K. Subramanya, Tata McGraw Hill Publishers
2. Flow through Open channels by K.G. Ranga Raja, Tata Mc Graw Hill Publishers
3. Fluid Mechanics, and hydraulic machine, Rajput, S chand Publications.
4. Hydraulics and Fluid Mechanics including Hydraulic machinery By P.N. Modi, S.M Seth, Standard

book house.

References:

1. Open channel hydraulics by Ven Te Chow. Mc Graw Hill Companies
2. Fluid Mechanics by V.L. Streeter, Mc Graw Hill Companies

Fluid Mechanics by K.L. Kumar, S. Chand publications.

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OE-II / IV	OPEN ELECTIVE	L	T	P	C
		3	0	0	3
f) GREEN TECHNOLOGY					

Course Learning Objectives:

The objective of this course is:

1. To present different concepts of green technologies.
2. To acquire principles of Energy efficient technologies.
3. To impart knowledge on the methods of reducing CO2 levels in atmosphere.
4. To gain knowledge of the importance of life cycle assessment
5. To learn the importance of green fuels and its impact on environment.

Course Learning Outcomes

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

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

SYLLABUS:

UNIT- I

Introduction: Green Technology – definition- Importance – Historical evolution – advantages and disadvantages of green technologies-factors affecting green technologies- Role of Industry, Government and Institutions – Industrial Ecology – role of industrial ecology in green technology. Cleaner Production (CP): Definition – Importance – Historical evolution - Principles of Cleaner Production–Benefits–Promotion-Barriers – Role of Industry,

UNIT- II

Cleaner Production Project Development and Implementation:
Government and Institutions – clean development mechanism, reuse, recovery, recycle, raw material substitution-Wealth from waste, case studies.
Overview of CP Assessment Steps and Skills, Process Flow Diagram, Material Balance, CP Option Generation – Technical and Environmental Feasibility analysis – Economic valuation of alternatives - Total Cost Analysis – CP Financing – Preparing a Program Plan – Measuring Progress- ISO 14000.

UNIT- III

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

UNIT -IV

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

UNIT- V

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

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

TEXT BOOKS:

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

2. 'Cleaner Production Audit' by Prasad Modak, C.Visvanathan and Mandar Parasnis (1995), Environmental System Reviews, No.38, Asian Institute of Technology, Bangkok
3. 'Non-conventional Energy Sources' by Rai G.D.

REFERENCES:

1. 'Pollution Prevention and Abatement Handbook – Towards Cleaner Production' by World Bank Group (1998), World Bank and UNEP, Washington D.C.
2. 'Handbook of Organic Waste Conversion' by Bewik M.W.M.
3. 'Energy, the Solar Hydrogen Alternative' by Bokris J.O.
4. 'Solar Energy' by Sukhatme S.P.

'Waste Energy Utilization Technology' by Kiang Y. H.

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OE-II / IV	OPEN ELECTIVE	L	T	P	C
		3	0	0	3
g) REMOTE SENSING & GIS					

Course Learning Objectives:

The course is designed to,

1. Introduce the basic principles of Remote Sensing and GIS techniques.
2. Learn various types of sensors and platforms.
3. Learn concepts of visual and digital image analysis.
4. Understand the principles of spatial analysis.
5. Appreciate application of RS and GIS to Civil Engineering

Course outcomes

At the end of the course the student will be able to

A. Be familiar with ground, air and satellite-based sensor platforms.
B. interpret the aerial photographs and satellite imageries.
C. create and input spatial data for GIS application.
D. apply RS and GIS concepts for application in Civil Engineering.

SYLLABUS:

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, types of resolutions - advantages & limitations, 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 & Recent satellite.

UNIT – II

Image analysis: Introduction, elements of visual interpretations, digital image processing- image pre-processing, image enhancement, image classification, supervised classification, unsupervised classification.

UNIT – III

Geographic Information System: Basic Principles, components, application areas of GIS, map projections. Data entry and preparation: spatial data structures, raster and vector data formats, data inputs, data manipulation, data retrieval, data analysis and data display.

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.

UNIT – V

RS and GIS applications: Land cover and land use, agriculture, forestry, geology, geomorphology, urban & transportation, Hydrology and Water Resources: Flood zoning and mapping, groundwater

prospects, groundwater quality monitoring and potential recharge zones, watershed management of application with case studies.

TEXTBOOKS:

1. 'Remote Sensing and GIS', by Bhatta B, Oxford University Press, (2011) 2nd Edition'.
2. 'Remote Sensing and Image Interpretation, by Lillesand, T.M, R.W. Kiefer and J.W. Chipman, Wiley India Pvt. Ltd., (2015), 7th Edition.
3. 'Remote Sensing - Models and Methods for Image Processing' by Robert A Schowenger, Elsevier publishers, (2009).
4. 'Fundamentals of Remote Sensing' by George Joseph, Universities Press, (2013) 3rd Edition.
5. 'Fundamentals of Geographic Information Systems' by Michael N. Demers, Wiley India Pvt. Ltd, (2012) 4th Edition.

REFERENCES:

1. 'Remote Sensing and its Applications' by Narayan LRA, Universities Press, 2012.
2. 'Concepts and Techniques of Geographical Information System' by Chor Pang Lo and Albert K.W. Yeung, Prentice Hall (India), (2016) 2nd Edition.
3. 'Introduction to Geographic Information Systems' by Kang Tsung Chang, McGraw Hill Higher Education, (2020) 9th Edition.
4. 'Basics of Remote sensing & GIS' by S. Kumar, Laxmi Publications, New Delhi, 2005.

'Principals of Geographical Information Systems' by Burrough P A and R.A. McDonnell, Oxford University Press, 2006

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IV YEAR – II SEMESTER **Major Project-12, Internship-6 Months, Total-12**

L	T	P/D	C
-	-	-	12

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DEPARTMENT OF CIVIL ENGINEERING

Honors R20 (Starts from II-II)

(4 x 4 + 2 MOOCS/NPTEL x 2 = 20 Credits) for Civil Engg. students

Note: Student must choose subjects which were not opted earlier.

(Any FOUR courses may be chosen by the Student from each Pool)

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HC (SE)	DEPARTMENT OF CIVIL ENGINEERING HONOR COURSE (SE)	L	T	P	C
		3	1	0	4
a) FINITE ELEMENT METHOD					

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

CO1	Develop finite element formulations of 1 degree of freedom problems and solve them
CO2	Understand any Finite Elements of twaretoper form stress, thermal and modal analysis
CO3	Compute the stiffness matrices of different elements and system
CO4	Interpret displacements, strains and stress resultants
CO5	Analyze planar structural systems using finite element modeling

Mapping of Course Outcomes with Program Outcomes:

	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	PSO 3
CO 1	-	1	3	-	-	-	-	1	-	-	-	-	-	-	2
CO 2	-	-	2	3	-	-	-	1	-	-	-	-	-	-	2
CO 3	-	-	2	3	-	-	-	1	-	-	-	-	-	-	2
CO 4	-	-	3	2	-	-	-	1	-	-	-	-	-	-	3
CO 5	-	-	2	3	-	-	-	1	-	-	-	-	-	-	2

1. **Slightly2.Moderately3.Substantially**

Detailed Syllabus:

UNIT: I

Introduction: Review of stiffness method- Principle of Stationary potential energy-Potential energyofanelasticbody-Rayleigh-Ritzmethodoffunctionalapproximation-variational approaches-weighted residual methods

UNIT: II

Finite Element formulation of truss element: Stiffness matrix-properties of stiffness matrix –Selectionofapproximatedisplacementfunctions-solutionofaplanetruss-transformation matrix and stiffness matrix for a 3-D truss- Inclined and skewed supports- Galerkin's methodfor1-Dtruss–Computation of stress in a truss element.

UNIT: III

Finite element formulation of Beam elements: Beam stiffness-assemble a geof beam stiffness matrix-Examples of beam analysis for concentrated and distributed loading-Galerkin's method - 2-D arbitrarily

oriented beam element – inclined and skewed supports – rigid plane frame examples

UNIT: IV

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

UNIT: V

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

TEXT BOOKS

1. A first course in the Finite Element Method–DarylL. Logan, Thomson Publications.
2. ConceptsandapplicationsofFiniteElementAnalysis–Robert D.Cook, Michael E Plesha, JohnWiley&Sons Publications

REFERENCES:

1. Introduction to Finite Elements in Engineering- Tirupati R. Chandrupatla, Ashok D. Belgunda, PHI publications.
2. FiniteElementMethods(ForStructuralEngineers)WailNRifaie,AshokKGovil,New Age International(P)Limited

HC (SE)	HONOR COURSE (SE)	L	T	P	C
		3	1	0	4
b) MATRIX ANALYSIS OF STRUCTURES					

Pre-Requisites: None

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

CO1	Perform the structural analysis of determinate and indeterminate structures using classical compatibility methods, such as method of consistent displacements, force and equilibrium

	Methods
CO2	Perform structural analysis using the stiffness method
CO3	Solve multiple degree of freedom two and three dimensional problems involving trusses, beams, frames and plane stress
CO4	Understand basic finite element analysis

UNIT: I

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

UNIT: II

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

UNIT: III

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

UNIT: IV

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

UNIT: V

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

TEXT BOOKS

1. Matrix analysis of structures- Robert E Sennet- Prentice Hall-Englewood cliffs-New Jercy
2. Advanced structural analysis-Dr. P. Dayaratnam-Tata McGraw hill publishing company limited.

REFERENCES

1. Indeterminate Structural analysis- C K Wang, Amazon Publications
2. Analysis of Tall buildings by force — displacement — Method M. Smolira Mc. Graw Hill.
3. Foundation Analysis and design – J.E. Bowls, 5e, Amazon Publications.
4. Structural Analysis Matrix Approach - Pandit and Guptha, Mc Graw Hil Education

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HC (SE)	HONOR COURSE (SE)	L	T	P	C
		3	1	0	4
c) EARTHQUAKE RESISTANT DESIGN					

Pre-Requisites: Soil Mechanics, Advanced Soil Mechanics, foundation Engineering-I Course

Out comes: At the end of the course, the student will be able to

CO1	To learn the fundamentals of seismology and basic earthquake mechanisms, Tectonics types of ground motion, and propagation of ground motion.
CO2	Understand qualitative and quantitative representations of earthquake magnitude
CO3	Determinethenaturalfrequencyofasingledegreeoffreedomdynamicsystem For given mass, stiffness and damping properties.
CO4	Determinethemaximumdynamicresponseofanelasticvibratingstructuretoa given forcing function
CO5	Learn the fundamentals of building code based structural design

Detailed Syllabus:

UNIT: I

Engineeringseismology–reboundtheory–platetectonics–seismicwaves-earthquake size and various scales–local site effects–Indian seismicity–seismic zones of India– theory of vibrations–near ground and far ground rotation and their effects

UNIT: II

Seismic design concepts – EQ load on simple building – load path – floor and roof diaphragms – seismic resistant building architecture – plan configuration – vertical configuration–pounding effects– mass and stiffness irregularities–torsion in structural system-Provision of seismic code (IS1893&13920)–Building system–frames–shear wall–braced frames–layout design of Moment Resisting Frames(MRF)–ductility of MRF– Infill wall–Non-structural elements

UNIT: III

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

UNIT: IV

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

UNIT: V

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

TEXT BOOKS

1. Earthquake Resistant Design of Structures Pankaj Agarwal and Manish ShriKhande, Prentice–Hall of India, 2007, New Delhi.
2. EarthquakeResistantDesignofStructures-S.K.Duggal,OxfordPublications

REFERENCE

1. Bullen K.E. Introduction to the Theory of Seismology, Great Britain at the University Printing houses, CambridgeUniversityPress1996.
2. Earthquake Resistant Design and Risk Reduction-David Dowrick
3. IS4326-1998:EarthquakeResistantDesignandConstructionofBuildings
4. IS1893(Part1to5)-2002:GeneralProvisionsandBuilding
5. IS 4928–1993: Code of practice for Earthquake Resistant Design and Construction of Buildings
6. IS13920-1997:CodeofPracticeforDuctileDetailingofReinforcedConcreteStructures subjected to Seismic Forces
7. IS13935-1993:GuidelinesforRepairandSeismicStrengtheningofBuilding

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HC (SE)	HONOR COURSE (SE)	L	T	P	C
		3	1	0	4
d) PRE-STRESSED CONCRETE					

Course Learning Objectives:

The objective of this course is to:

- Familiarize Students with concepts of pre stressing
- Equip student with different pre stressing systems and devices
- Understand losses of pre stress including short and long-term losses
- Familiarize students with analysis and design of pre stressed concrete members under flexure, shear and torsion

Course Outcomes:

At the end of this course the student will be able to

- Understand different methods of pre stressing
- Estimate effective pre stress including short and long-term losses
- Analyse and design pre stressed concrete beams under flexure and shear
- Understand the relevant IS Code provisions for pre stressed concrete

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	2	-	-	-	1	-	1	-	-	1	-	-	2	1
CO2	-	3	1	-	-	1	-	1	-	-	1	-	-	-	3
CO3	1	2	3	-	-	1	-	1	-	-	1	-	-	-	2
CO4	-	1	3	2	-	1	-	1	-	-	1	-	-	-	3
CO5	-	-	2	3	-	1	-	1	-	-	1	-	-	-	3

1 - Slightly 2 - Moderately 3 – Substantially

SYLLABUS:

UNIT-I Introduction &Methods and Systems of pre stressing Historic development- General principles of pre stressing pre tensioning and post tensioning- Advantages and limitations of Pre stressed concrete- General principles of PSC- Classification and types of pre stressing- Materials- high strength concrete and high tensile steel their characteristics. Pre tensioning and Post tensioning methods and systems of pre stressing like Hoyer system, Magnel Blaton system, Freyssinet system and Gifford- Udall System- Lee McCall system

Flexure: Analysis of sections for flexure- beams pre stressed with straight, concentric, eccentric, bent and parabolic tendons, Line of Thrust – Pressure Line, Load Balancing Concept.

UNIT-II Losses of Pre-stressing- Loss of Pre-stress in pre-tensioned and post tensioned members - Elastic shortening, shrinkage, and creep of concrete; Relaxation of steel, slip in anchorage, and frictional losses- Total loss and allowable loss of pre stress for design.

UNIT-III Design for Flexure - Types of failure – Code procedures - Design for flexure using IS Code (IS 1343 -2012) Cable profile in two span continuous members.

UNIT-IV Design for Shear and Torsion- Shear and Principal Stresses- Design of Shear Reinforcement-Code Provisions- Design for Torsion, Design for combined bending, shear and torsion.

UNIT-V

Deflections: Importance of control of deflections- Factors influencing deflections – Short term deflections of Un cracked beams- prediction of long time deflections- IS code requirements.

Applications adopting pre stressing concepts (only concepts): Poles, Pipes, Piles, Slabs & Railway Sleepers.

Text Books: -

1. Pre stressed Concrete by N.Krishna Raju, 6e Tata Mc Graw Hill Bookco.
2. Pre stressed Concrete by K.U.Muthu PHI Learning Pvt.Ltd.

References:

1. Design of pre stress concrete structures by T.Y. Lin and Burn, John Wiley, New York.
2. Pre stressed Concrete by N. Rajagopalan Narosa Publishing House.
3. Pre stressed concrete by S. Ramamrutham Dhanpat Rai & Sons, Delhi. 4. IS1343:2012

HC (SE)	HONOR COURSE (SE)	L	T	P	C
		3	1	0	4
e) REPAIR AND REHABILITATION OF STRUCTURES					

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

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CO1	Recognize the mechanisms of degradation of concrete structures and to design durable Concrete structures
CO2	Conduct field monitoring and non-destructive evaluation of concrete structures.
CO3	Design and suggest repair strategies for deteriorated concrete structures including Repairing with composites.
CO4	Understand the methods of strengthening methods for concrete structures
CO5	Assessment of the service ability and residual life span of concrete structures by Visual inspection and in situ tests

Mapping of Course Outcomes with Program Outcomes:

	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	PSO 31
CO 1	3	3	2	2	1	-	1	-	2	2	-	1	-	2	-
CO 2	2	2	1	3	3	-	-	-	2	-	-	2	-	-	2
CO 3	2	1	1	-	-	-	2	1	1	-	1	1	-	3	2
CO 4	3	1	2	1	1	-	-	1	1	1	1	2	-	1	2
CO 5	3	3	2	2	1	-	1	-	2	2	-	1	-	2	-

1. **Slightly2.Moderately3.Substantially**

Detailed Syllabus:

UNIT: I

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

UNIT: II

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

UNIT: III

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

UNIT: IV

Fiber reinforced concrete-Properties of constituent materials-Mix proportions, mixing and casting methods-Mechanical properties of fiber reinforced concrete-Applications of fiber reinforced concretes-Light weight concrete-properties of light weight concrete-No fines concrete-design of light weight concrete-Fly ash concrete-Introduction-classification of fly ash-properties and reaction mechanism of fly ash-Properties of fly ash concrete in fresh state and hardened state-Durability of fly ash concretes

UNIT: IV

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

TEXT BOOKS

1. MaintenanceRepairRehabilitation&MinorworksofBuildings-P.C.Varghese,PHI Publications
2. RepairandRehabilitationofConcreteStructures—P.I.Modi,C.N.Patel,PHIPublications
3. RehabilitationofConcreteStructures-B.Vidivelli,StandardPublishersDistributors
4. Concrete Bridge Practice Construction Maintenance & Rehabilitation-V.K.Raina, Shroff Publishers and Distributors.

REFERENCE:

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

HC (GTE)	HONOR COURSE (GTE)	L	T	P	C
		3	1	0	4
a) REINFORCED SOIL STRUCTURES					

Course objectives:

1. To understand the history and mechanism of reinforced soil
2. To know the various types of geo-synthetics, their functions and applications.
3. To enable the design of reinforced soil retaining structures.

Expected Outcomes:

The students will

a) Understand the history and mechanism of reinforced soil
b) Become aware about situations where geo-synthetics can be used.
c) Know about various types of geo-synthetics and their functions
d) Be able to do dimple design of reinforced soil retaining walls and reinforced earth beds.

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	1	1	3	2	1	1	-	-	-	-	1	3	-	1
CO2	3	2	1	3	2	1	1	-	-	-	-	1	3	-	1

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1 - Slightly 2 - Moderately 3 – Substantially

SYLLABUS:

Unit I:
Introduction -history –ancient and modern structures- Types of geo-synthetics, advantages, disadvantages. Functions of geo-synthetics and application areas where these functions are utilized such as in retaining walls, slopes, embankments, railway tracks, pavements etc. (general overview). Raw materials used for geo-synthetics, manufacturing process of woven and non-woven geotextiles, geo-membranes, geo-grids.

Unit II:
Properties of geo-synthetics. Creep and long term performance. Reinforced soil - Advantages and disadvantages. Fills, Types of facings, Factors affecting the performance and behavior of reinforced soil. Mechanism of reinforcement action - Equivalent Confining Stress Concept, Pseudo Cohesion Concept, Concept of Expanding soil mass. – Simple problems.

Unit III:
Design and analysis of vertically faced reinforced soil retaining walls- External stability and internal stability – Tie back wedge analysis and coherent gravity analysis with metallic strip and continuous geo-synthetic reinforcements. Assumptions, limitations and numerical problems. Construction methods of reinforced retaining walls. Geo-synthetics in pavements, function and benefits.

Unit IV:
Bearing capacity improvement using soil reinforcement – Binquet and Lee's analysis – Assumptions, failure mechanisms. Simple problems in bearing capacity. Geo-synthetics for short term stability of embankments on soft soils. Natural geotextiles, Advantages and disadvantages, functions, erosion control- types of erosion control products, installation methods.

Unit V:
Prefabricated vertical drains along with design principles and installation method Concept of Geo-cells, Gabion Walls, encased stone columns, geo-composites, soil nailing, geo-tubes, geo-bags (only basic concepts), Natural geotextiles using coir and jute with relative advantages and disadvantages, application areas, application in landfills.

Text Books:

1. Jones, C.J.F.P. (1985). Earth reinforcement and soil structures. Butterworth, London.
2. Rao, G.V. (2007). Geo-synthetics – An Introduction. Sai Master Geo-environmental Services Pvt. Ltd., Hyderabad

References:

1. Koerner, R.M. (1999). Designing with Geo synthetics, Prentice Hall, New Jersey, USA, 4th edition.
2. Rao, G.V., Kumar, S. J. and Raju, G.V.S.S. (Eds.). Earth Reinforcement – Design and Construction. Publication No. 314, Central Board of Irrigation and Power, New Delhi, 2012.

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3. Siva Kumar Babu, G.L. (2006). An introduction to soil reinforcement and geo synthetics. United Press (India) Pvt. Ltd.

HC (GTE)	HONOR COURSE (GTE)	L	T	P	C
		3	1	0	4
b) ADVANCED FOUNDATION ENGINEERING					

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

CO1	Understand classification of piles and determine the load carrying capacity of piles by various methods
CO2	Determine the load carrying capacity of pile groups
CO3	Evaluate the pull-out capacity of piles and down drag forces on piles due to negative skin friction
CO4	Determine the load carrying capacity of laterally loaded piles
CO5	Determine the load carrying capacity of piers and caissons

Syllabus:

Unit: I

Pile Foundations-Classification of Piles-Factors influencing - Choice- Load Carrying Capacity of Single Piles in Clays and Sands Using Static Pile Formulae- α - β - and λ - Methods –Dynamic Pile Formulae-Limitations-Monotonic and Cyclic Pile Load Tests.

Unit: II

Pile group's -Efficiency of Pile Groups- Different Formulae-Load Carrying Capacity of Pile Groups in Clays and Sands – Settlement of Pile Groups in Clays and Sands – Computation of Load on each Pile in a Group.

Unit: III

Pull-out resistance of piles -Meyerhof's, Vesic's equations and Coyle and Castello correlations for piles in sands (Elastic settlement of piles) - Pull out Resistance of piles - Negative skin friction in piles – Typical field situations – Estimation of down drag - Neutral point – Methods of minimizing down drag.

Unit: IV

Laterally loaded vertical piles - Modulus of subgrade reaction – Piles in granular soils and cohesive soils subjected to lateral loading - Matlock & Reese analysis for piles in sands - Davisson & Gill analysis for piles in clays, Broms' Analysis for piles in sands and clays.

Unit: V

Drilled pier and Caisson Foundations – Types of Drilled piers – Load carrying capacity of piers in clays and sands, Uplift capacity of piers, Caissons – Types – Pneumatic Caisson – Well Foundations – Design of components – Design of wells – Lateral stability of well foundations – Terzaghi's analysis.

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REFERENCE

1. Principles of Foundation Engineering - Braja M. Das
2. Foundation Analysis and Design – J.E. bowles, McGraw – Hill Publishing Co.,
3. Analysis and design of foundations and Earth Retaining Structures. –S. Prakash, Gopal Rajan and Swami Saran – Sarita Prakasan, Merut.
4. Foundation Design and Construction – M.J. Tomlinson, Pitman
5. Soil Mechanics and Foundation Engineering, Vol. II, Foundation Eng., - VNS Murthy
6. Pile Foundation Analysis & Design by Poulos and Davis.

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		3	1	0	4

c) EARTH RETAINING STRUCTURES

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

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

Mapping of Course Outcomes with Outcomes:

Course Out Comes	PO1	PO2	PO3	PO4	PO5
CO1	1	--	2	3	1
CO2	1	--	2	1	1
CO3	3	--	1	1	--
CO4	1	1	2	2	3
CO5	--	2	3	1	--
CO6	--	2	--	--	--
CO7	1	2	1	2	1

1. **Slightly 2. Moderately 3.Substantially**

Detailed Syllabus:

Unit: I

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

Unit: II

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

Unit: III

Sheet Pile Structures – Types of Sheet piles – Cantilever sheet piles in sands and clays – Anchored sheet piles – Free earth and fixed earth support methods – Rowe's moment reduction method – Location of anchors and Design of Anchorage system.

Unit: IV

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

Unit: V

Braced cuts and Cofferdams: Lateral Pressure in Braced cuts – Design of Various Components of a Braced

cut – Stability of Braced cuts – Bottom Heave in cuts. – Types of cofferdam, suitability, merits and demerits – Design of single – wall cofferdams and their stability aspects – FVA method and Cummins' methods.

REFERENCES

1. Principles of Foundation Engineering by Braja M. Das.
2. Foundation analysis and design – Bowles, JE – McGraw Hill
3. Soil Mechanics in Engineering Practice – Terzaghi, K and Rolph, B. peck 2nd Edn. – John Wiley & Co.,
4. Analysis and Design of Foundations and Retaining Structures, Prakash, S – Saritha Prakashan, Mearut.

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		3	1	0	4
d) GEOENVIRONMENTAL ENGINEERING					

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

CO1	Understand various ground contaminations, pollution transport phenomena.
CO2	Collect pollutant data
CO3	Apply principles to get the information about the transport through the unsaturated soil
CO4	Develop various models for contamination transport.

Mapping of Course Outcomes with Program Outcomes:

Course Out Comes	PO1	PO2	PO3	PO4	PO5
CO1	2	--	1	--	1
CO2	1	--	3	1	1
CO3	1	1	2	1	2
CO4	--	2	2	1	2

1. **Slightly 2. Moderately 3. Substantially Detailed**

Syllabus:

Unit: I

Introduction- Ground water contamination, pollutant transport and ground water remediation. Sources and Types of ground water contamination – underground storage tanks, Landfills, surface impoundments, waste disposal injection wells, Septic system, Agricultural wastes, Land application, radioactive contamination, other sources of contamination.

Unit: II

Data Collection methods: Introduction, Geological data acquisition – Drilling methods – Solid flight auger drilling – Hollow stem auger drilling – Wet rotating drilling – Hand auger soil boring – sample collection – Soil core logging – Cone penetration testing – Geophysical methods; Hydrologic data acquisition – monitoring well construction – well material – Screen interval selection – Installation procedure – Survey specification – Protective casing requirements – Well development procedures; Acquisition of soil and Ground water quality data.

Unit: III

Contaminant Transport Mechanisms: Introduction – Advection process – Diffusion – Dispersion process – Diffusion – Mass transport Equations : Derivation of advection dispersion equation for solute transport; One Dimensional Models – Continuous source in one dimension – Instantaneous source in one dimension – Adsorption effects – Transport in one dimensional with first order decay – Sorption: The concept of sorption. Factors influencing sorption – Contaminant characteristics, Soil characteristics, Fluid media characteristics. Sorption Isotherm: Linear sorption Isotherm – Freundlich Sorption isotherm – Langmuir Sorption Isotherm, Sorption effects on fate and transport of pollutants.

Unit: IV

Flow and Transport of Pollutants in Unsaturated zone: Capillarity, soil-water characteristic curves, Unsaturated Hydraulic conductivity, Governing equation for unsaturated flow, measurement of soil properties.

Unit: V

Non – Aqueous Phase Liquids (NAPLs): Introduction – Comparison of fate of dissolved mass versus NAPL mass- Types of NAPLs – LNAPL – DNAPL; NAPL Transport – general process – NAPL transport at the pore level - Downward Migration of DNAPLs in saturated zone – NAPL movement through Vadose zone – LNAPL behaviour at the water table – NAPL Transport at the site level – LNAPL conceptual models – DNAPL conceptual models, NAPL transport.

TEXT BOOKS:

1. Ground water Contamination (Transport and Remediation) By Philip. B. Bedient, Hanadi, S. Rifai & Charles. J. Newell, Prentice Hall PTR, Upper Saddle River, NJ07458.

REFERENCES

1. Geo environmental Engineering by R. Krishna Reddy - John Wiley & Sons, Inc.
2. Geotechnical Engineering by Gulahati, S.K. and Datta, M. – Tata McGraw Hill Publishing Company
3. Geotechnical Engineering Principles and Practices by Coduto – Pearson Education (PHI)
4. Geo environmental engineering by Reddy, L.N and Inyang, I.H. – Marcel Drekker, 2000.
5. Environmental geo techniques by Sarsby, R. – Thompson Telford, 2000.Geotechnical Practices for Waste Disposal by Daniel, D.E., 1993

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		3	1	0	4
e) EARTH AND ROCKFILL DAMS					

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

CO1	Understand the basic concepts of earth-fill dams and rock-fill dams and identify the site topography and foundations conditions
CO2	Identify basic design requirements and causes of failures of dams, distinguish foundation types and the different fill materials
CO3	Estimate seepage through dam sections, foundations and select core and shell materials
CO4	Understand and design the methods to control seepage through different units of dams
CO5	Able to undertake slope stability analysis of dams
CO6	distinguish different types of instruments like piezometers, settlement gauges and inclinometers to install for performance studies of dams

Mapping of Course Outcomes with Outcomes:

Course Out Comes	PO1	PO2	PO3	PO4	PO5
CO1	1	1	1	1	1
CO2	1	--	2	2	3
CO3	1	2	2	2	2
CO4	--	1	--	3	3
CO5	2	1	1	2	2
CO6	--	1	--	2	3

1. **Slightly 2. Moderately 3.Substantially**

Detailed Syllabus:

Unit: I

BASIC CONCEPTS AND MISCELLANEOUS TOPICS. Evolution – Types of Dams – Earth fill Dams – Rock fill Dams – Selection of Type of Dam – Site Topography – Foundation Conditions – Basic Design Requirements – Causes of Failure and Deterioration of Dams – Design Investigations – Fill Material – Foundations – Design Studies .

Unit: II

SEEPAGE THROUGH DAM SECTION AND ITS CONTROL: Estimation of Seepage through Dam Section and foundation – Considerations in selection and design of core and determination of shell material
Drains: – Pervious Downstream Shell – Chimney Drains – Rock Toe and Drains – Use of Geo-textiles as Filter Material.

Unit: III

CONTROL OF SEEPAGE THROUGH FOUNDATIONS: General Considerations – different types of cut off

walls – Provision of d/s aprons – relief wells

SLOPE PROTECTION – Necessity with respect to u/s and d/s slopes – u/s slope protection by Dumped Riprap- Hand-placed Riprap – Soil-Cement Slope Protection – Downstream Slope Protection by providing berms - grass turfing.

Unit: IV

STABILITY ANALYSIS OF SLOPES OF EARTH DAMS: Slope stability analysis techniques –Methods of Slices, Fellinious Method, Simplified Bishop method, Taylor's method, Simplified Janbu's Method; Stability of earth dam slopes – u/s slope during sudden drawdown, d/s slope during steady seepage, stability of u/s and d/s slopes during and after construction.

Unit: V

INSTRUMENTATION: – Purpose - Types of Instruments and Brief Description – Installation – piezometers -- Casagrande and Vibration wire -- Settlement gauges – Inclinometers.

REFERENCE:

1. Earth Dams by HD Sharma
2. Earth and Rock fill Dams HD Sharma & Bharat Singh

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		3	1	0	4

a) URBAN HYDROLOGY

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

CO1	Basic concepts of Urban Hydrological cycle and effect of urbanization on hydrology
CO2	Understanding the basic concepts of precipitation analysis
CO3	Knowledge about the methods of quantity estimation of storm water
CO4	Analyse the Infrastructure for storm water management
CO5	Explain about the Study the process of urbanization and its influence on urban hydrological processes and urban water supply system including, storm water modelling.

Mapping of Course Outcomes with Program Outcomes:

Course Outcomes	PO1	PO2	PO3	PO4	PO5
CO1	3	3	3	-	2
CO2	3	3	3	-	2
CO3	-	3	3	1	2
CO4	-	1	3	-	2
CO5	3	3	3	-	2

1. Slightly 2. Moderately 3. Detailed

Syllabus:

Unit I:

Introduction: Urbanisation and its effect on water cycle – urban hydrologic cycle – trends in urbanisation – Effect of urbanisation on hydrology, need for urban drainage system, population forecasting.

Unit II:

Precipitation Analysis: Importance of short duration of rainfall and runoff data, methods of estimation techniques for urban drainage systems, Intensity-Duration -Frequency (IDF) curves, design storms for urban drainage systems.

Unit III:

Quantity Estimation of Storm Water: Factors Affecting the Quantity of Storm water, Methods for Estimation of Quantity of Storm Water, Time of Concentration, zoning and runoff coefficient, peak flow estimation approaches -Rational method, NRCS curve number approach, Empirical formulae.

Unit IV:

Infrastructure for Storm Water Management: conventional drainage systems, underground drains, sustainable drainage systems, Requirements for Urban Drainage Design, Operation and Maintenance, source control.

Unit V:

Analysis and Management: Storm water drainage structures, Sewer appurtenances, design of storm water network- Best Management Practices–detention and retention facilities, constructed wetlands, models available for storm water management, Water conservation systems

References:

- Urban Drainage, David Butler and John W. Davies, Spon press, imprint of Tylor & Francis, London and New York.
- Report on Storm water Management, Adrián Morales Torres IIAMA - Universitat Politècnica de Valencia, Sara Perales Momparler Green Blue Management
- National Disaster Management Guidelines, Management of Urban flooding , National Disaster Management Authority of India
- Design guidelines for storm water drainage system (Ministry of Housing and Urban Affairs Manual : Part A – Engineering, Part B – O&M, Part C – Management)

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		3	1	0	4
b) WATER AND WASTE WATER MANAGEMENT					

Course Learning Objectives:
The course will address the following:

1. Enables the student to distinguish between the quality of domestic and industrial water requirements and wastewater quantity generation.
2. To impart knowledge on selection of treatment methods for industrial wastewater.
3. To know the common methods of treatment in different industries
4. To acquire knowledge on operational problems of effluent treatment plant.

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

1. Know the quality and quantity of water for various industries and Advanced water treatment methods
2. Learn the common methods of treatment of wastewaters and Biological treatment methods
3. Study of methods to reduce impacts of disposal of wasters into environment and CETPs.
4. Study of methods of treatment of wastewaters from specific industries like steel plants, refineries, and power plants, that imply biological treatment methods
5. Study of methods of treatment of wastewaters from industries like Aqua, dairy, sugar plants, and distilleries that imply biological treatment methods

Course Articulation Matrix:

	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	PSO 3
CO 1	3	3	3	3	1	3	1	1	-	-	-	1	2	-	3
CO 2	3	3	3	3	2	3	1	1	-	-	-	1	2	-	2
CO 3	3	3	3	3	2	3	3	2	-	-	-	1	1	-	2
CO 4	3	3	3	3	2	3	2	2	-	-	-	1	1	-	2
CO 5	3	3	3	3	1	3	2	2	-	-	-	1	1	-	2

1 - Slightly 2 - Moderately 3 – Substantially

SYLLABUS:

UNIT – I

Industrial water Quantity and Quality requirements: Boiler, Cooling, Domestic/Canteen and Process waters for Textiles, Food processing, Dairy, Aqua industry, Sugar mills, Brewery and distillery Industries, Fertilizer industry, Power plants. Advanced water treatment - Adsorption, Reverse Osmosis, Ion Exchange, Ultra filtration, freezing, elutriation, Removal of Iron and Manganese, Removal of Colour and Odour. Use of Municipal wastewater in Industries.

UNIT – II

Basic theories of Industrial Wastewater Management: Industrial waste survey - Measurement of industrial wastewater Flow-generation rates – Industrial wastewater sampling and preservation of samples for analysis - Wastewater characterization- Toxicity of industrial effluents- Common methods of Treatment of wastewaters - Unit operations and processes- Volume and Strength reduction –Neutralization – Equalization and proportioning- recycling, reuse and resources recovery. Miscellaneous Treatment: Biological treatment of sewage- Primary, secondary and Tertiary treatment of sewage.

UNIT – III

Industrial wastewater disposal management, Discharges into Sewers, Streams- Oxygen sag curve, Lakes-eutrophication and oceans and associated problems, Land treatment – sewage sickness, Common Effluent Treatment Plants: advantages and suitability, Limitations and challenges- Recirculation of Industrial Wastewaters- Effluent Disposal Method.

UNIT – IV

Process and Treatment of specific Industries-1: Manufacturing Process and origin, characteristics, effects and treatment methods of liquid waste from Steel plants, Fertilizers, Textiles, Paper and Pulp industries, Oil Refineries, Coal and Gas based Power Plants. Case studies.

UNIT – V

Process and Treatment of specific Industries-2: Manufacturing Process and origin, characteristics, effects and treatment methods of liquid waste from Tanneries, Sugar Mills, Distillers, Dairy and Food Processing industries, Aqua industry, Pharmaceutical Plants. Case studies.

TEXTBOOKS

1. Industrial Wastewater Treatment by KVSG Murali Krishna, Paramount Publishers, Visakhapatnam, 2019
2. Wastewater Treatment by M.N. Rao and A.K. Dutta, Oxford & IBH, New Delhi.
3. Industrial Wastewater treatment by A.D. Patwardhan, PHI Learning, Delhi
4. Wastewater Treatment for Pollution Control and Reuse, by Soli. J Arceivala,
5. Shyam R Asolekar, Mc-Graw Hill, New Delhi; 3rd Edition

REFERENCES

1. Industrial Water Pollution Control by W. Wesley Eckenfelder, Mc- GrawHill, Third Edition
2. Wastewater Engineering by Metcalf and EddyInc., Tata McGrawhillCo., New Delhi
3. Wastewater Treatment- Concepts and Design Approach by G.L. Karia & R.A. Christian, Prentice Hall of India.
4. Unit Operations and Processes in Environmental Engineering by Reynolds. Richard, Cengage Learning.

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		3	1	0	4

c) WATER RESOURCES PLANNING AND MANAGEMENT

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

CO1	Basic concept of Water Resources Planning process with detail
CO2	Explain briefly about the basic concept of water plans
CO3	Develop the various algorithms to solve linear as well as non-linear problems
CO4	Analyse the River basin modelling and requirements of reservoir storage
CO5	Explain about the Ground water management models
CO6	Develop the water quality management models

Mapping of Course Outcomes with Program Outcomes:

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6
CO1	-	2	1	-	1	1
CO2	-	1	1	-	1	1
CO3	-	-	2	2	1	-
CO4	-	2	3	3	2	1
CO5	-	2	3	3	2	1
CO6	-	2	3	3	2	1

1. Slightly 2. Moderately 3. Detailed

Syllabus:

Unit I:
Introduction: Water resources planning process, multi-objective planning.

Unit II:
Evaluation of Water Plans: Basic concepts of engineering economics, welfare economics and economic comparison of alternatives.

Unit III:
Water Plan Optimization: Plan formulation, objective functions and constraint, analytical optimization, numerical optimization, linear programming, dynamic programming, simulation, planning under uncertainty.

Unit IV:
Deterministic River Basin Modelling: Stream flow modelling, estimation of reservoir storage requirements – dead storage, active storage for water supply/ irrigation / power generation, flood storage, optimal allocation.

Unit V:
Conjunctive Use/Groundwater Management Models: linear programming based conjunctive use modelling,

aquifer response models, link – simulation, embedded, – matrix response based models, soft modelling.

Unit VI:

Water Quality Management Models: Basic water quality modelling, objectives of management, control alternatives, optimal plans

References:

- Hall, W.A. and Dracup, J.A., "Water Resources Systems Engineering", McGraw Hill Book Company. 1970
- Loucks, D.P., "Water Resource Systems Planning and Analysis", Prentice Hall. 1981
- Maass et al., "Design of Water-Resource Systems", Harvard University Press. 1962
- Vedula S. and Mujumdar, P.P., "Water Resources Systems", Tata McGraw Hill. 2005

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		3	1	0	4

d) ENVIRONMENTAL IMPACT ASSESSMENT

Course Learning Objectives:

The objective of this course is:

1. To impart knowledge on different concepts of Environmental Impact Assessment
2. To know procedures of risk assessment
3. To learn the EIA methodologies and the criterion for selection of EIA methods
4. To know pre-requisites for ISO 14001certification
5. To know the procedures for environmental clearances and audit
6. To appreciate the importance of stakeholder participation in EIA

Course Learning Outcomes

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

a) Prepare EMP, EIS and EIA report, estimate cost benefit ratio of a project
b) Selection of an appropriate EIA methodology
c) Evaluation of impacts on environment
d) Evaluation of risk assessment
e) Know the latest acts and guidelines of MoEF & CC

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	1	2	2	2	2	1	2	2	-	-	1	-	-
CO2	1	2	2	1	2	2	2	2	2	1	-	-	-	-	2
CO3	1	2	2	1	2	1	2	2	1	-	-	1	-	-	1
CO4	1	2	2	2	3	2	3	1	3	1	2	1	-	-	1
CO5	1	2	2	2	3	2	3	1	3	1	2	1	-	-	1

1 - Slightly 2 - Moderately 3 – Substantially

SYLLABUS:

UNIT-I:

Basic concepts of EIA: Elements of EIA-factors affecting EIA-Initial environmental Examination-life cycle analysis preparation of Environmental Base map- Classification of environmental parameters – role of stakeholders in the EIA preparation – stages in EIA, Environmental economics, Cost/benefit Analysis - EIS and EMP. Identification of activities- application of remote sensing and GIS for EIA.

UNIT-II:

EIA Methodologies: Introduction, Criteria for the selection of EIA Methodology, E I A methods, Ad-hoc methods, matrix methods, Network method Environmental Media Quality Index method, overlay methods.

Impact of Developmental Activities and Land use: Introduction and Methodology for the assessment of soil and ground water, Delineation of study area

UNIT-III

Procurement of relevant soil quality, Impact prediction, Assessment of Impact significance,

Identification and Incorporation of mitigation measures - EPA with reference to surface water, Air and Biological environments. Methodology for the assessment of Impacts on surface water environment, generalized approach for assessment of Air pollution Impact.

UNIT-IV: Assessment of Impact of development Activities on Vegetation and wildlife, Environmental Impact of Deforestation. Environmental Risk Assessment and Risk management in EIA: Risk assessment and treatment of uncertainty-key stages in performing an Environmental Risk Assessment- Advantages of Environmental Risk Assessment

UNIT-V EIA: MoEF&CC Acts, Notifications and Guidelines: Provisions in the EIA notification, procedure for environmental clearance, and 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 ISO14000. Environmental compliance reports. Case studies and preparation of EIA statement for various Industries.

Text Books:

1. Environmental Impact Assessment, Canter Larry W., McGraw-Hill education Edi (1996)
2. Environmental Impact Assessment Methodologies, Y. Anjaneyulu, B. S. Publication, Sultan Bazar, Hyderabad.

References:

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

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		3	1	0	4

e) AIR POLLUTION AND CONTROL

Course objective:

1.To evaluate the fundamentals of air pollution control

2.To design the operation of various air pollution control devices

Course outcome:

Course will familiarize the students with technologies available for the control of air pollution. After successful completion of this course, student will be capable to decide and design an appropriate air pollution control system based on the problem at hand

UNIT-I

Introduction: Definition - Sources and classification of Air Pollutants - Photochemical smog - Effects of air pollution on health of Human & Animals, vegetation & materials, air quality standards, Global effects of air pollution.

UNIT-II

Meteorology and Dispersion of air pollutants: Temperature lapse rates and Stability, Wind velocity and turbulence, Wind Rose, plume behavior, Measurement of meteorological variables. Dispersion of Air pollutants: Gaussian Dispersion model - Equations for the estimation of pollutant concentrations of emissions

- Plume Rise –Effective stack height and mixing depths.

UNIT-III

Sampling, Analysis and Particulate Pollution Control Methods: Ambient air quality monitoring -High volume sampler- stack monitoring train and stack monitoring - Principles and design aspects of different typesof particulate pollution control equipment– Settling chambers, Cyclone separators, Scrubbers, Filters and Electrostatic precipitators,

UNIT-IV

Gaseous pollution control methods and automobile pollution: Gaseous pollutants' sampling and analysis- Types of gaseous pollution control methods – absorption, adsorption and combustion processes. Automobile pollution, sources of pollution, composition of auto exhausts, Control methods.

UNIT V

Noise Pollution: Definitions – Significance - sources, measurement - effects and control measures, legislations

Reference Books:

1. Air Pollution by M. N. Rao, Tata McGraw Hill Publication.
2. "Air pollution and control by KVSG Murali Krishna, Laxmi Publications, New Delhi, 2016.
3. Air Pollution by H. C. Perkins.
4. Environmental Engineering by Peavy and Rowe, McGraw Hill Publication.
5. Air Pollution Control Engineering by N.D. Nevers, McGraw Hill Publication.
6. Air Pollution control engineering by Noel de Nevers, McGraw Hill Publication, and New York.
7. Fundamentals of Air Pollution by Richard W. Boubel et al, Academic Press, New York.
8. Air Pollution: Physical and Chemical Fundamentals by John H. Seinfeld, McGraw Hill bookCo. 1988.

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		3	1	0	4
a) TRAFFIC ENGINEERING					

Course Learning Objectives:
The objectives of this course are:

1. To determine various components and characteristics of traffic.
2. To apply various traffic control devices and principles of highway safety.
3. To understand the detrimental effects of traffic on environment
4. To carry out highway capacity and level of service analysis.
5. To learn about intelligent vehicle highway systems.

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

a. Determine traffic speed, volume, travel time and density.
b. Design traffic signals
c. Determine highway capacity and LOS

Course Articulation Matrix:

	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	PSO 3
CO 1	3	2	---	--	2	-	1	-	-	-	-	1	-	-	1
CO 2	3	3	-	2	2	1	1	-	-	-	-	1	1	-	3
CO 3	3	3	3	2	3	1	1	-	-	-	-	1	-	-	3
CO 4	3	3	3	3	2	2	2	-	-	-	-	1	1	-	3
CO 5	3	3	3	2	3	1	1	-	-	-	-	1	-	-	3

1 - Slightly 2 - Moderately 3 – Substantially

SYLLABUS:

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

Environmental Considerations: Air pollution: Kinds of pollutants; Air pollution standards; Measures of air quality; modelling and control. Noise pollution: Measurement of sound levels; Acceptable limits, Prediction of noise levels, Traffic noise control, Air and Noise pollution mitigation measures.

UNIT- V

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.

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

REFERENCES:

1 'Traffic Engineering Hand Book' by Institute of Transportation Engineers, 4 Ed., Prentice Hall

2 'Traffic Engineering' by Mc Shane, WR and RP Roess, Prentice Hall

3 'Highway Traffic analysis and design' by Salter RJ and NB Hounsell, 3rd ed., Macmillan

4 'Traffic Planning and Engineering' by Hobbs FD., Pergamon press

5 'Traffic flow fundamentals' by May, AD., Prentice Hall

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HC(TE)	DEPARTMENT OF CIVIL ENGINEERING HONOR COURSE (TE)	L	T	P	C
		3	1	0	4
b) INTELLIGENT TRANSPORTATION SYSTEMS					

Course Learning Objectives:

1. To know the fundamentals of ITS
2. To study sensor technologies and Data requirements of ITS
3. To know ITS functional areas and user services
4. To study various kinds of ITS architecture
5. To study ITS applications in various fields of transportation engineering

Course Outcomes:

a) Identify the benefits of ITS from various types
b) Determine various sensor applications and ITS data collection techniques
c) Identify ITS user services and functional areas
d) Determine various ITS models, evaluation methods and ITS planning.
e) Determine the suitable ITS technology and assess its effectiveness to solve transportation problems

SYLLABUS

UNIT-I

Fundamentals of ITS: Definition of ITS s, the historical context of ITS from both public policy and market economic perspectives, Types of ITS; Historical Background, Benefits of ITS.

UNIT-II

Sensor technologies and Data requirements of ITS: Importance of telecommunications in the ITS system, Information Management, Traffic Management Centers (TMC). Application of sensors to Traffic management; Traffic flow sensor technologies; Transponders and Communication systems; Data fusion at traffic management centers; Sensor plan and specification requirements; Elements of Vehicle Location and Route Navigation and Guidance concepts; ITS Data collection techniques – Detectors, Automatic Vehicle Location (AVL), Automatic Vehicle Identification (AVI), GIS, video data collection.

UNIT-III

ITS functional areas – Advanced Traffic Management systems (ATMS), Advanced Trav Information systems (ATIS), Commercial Vehicle Operations (CVO), Advanced Vehicle Control systems (AVCS), Advanced Public Transportation systems (APTS), Advanced Rural Transportation systems (ARTS).

ITS User Needs and Services – Travel and Traffic management, Public Transportation Management, Electronic Payment, Commercial Vehicle Operations, Emergency Management, Advanced Vehicle safety systems, Information Management.

UNIT-IV

ITS Architecture – Regional and Project ITS architecture; Concept of operations; ITS Models and Evaluation Methods; Planning and human factor issues for ITS, Case studies on deployment

planning and system design and operation, ITS and safety, ITS and security, ITS as a technology deployment program, research, development and business models, ITS planning.

UNIT-V

ITS applications: Traffic and incident management systems; ITS and sustainable mobility, travel demand management, electronic toll collection, ITS and road-pricing.; Transportation network operations; commercial vehicle operations and intermodal freight; public transportation applications; ITS and regional strategic transportation planning, including regional architectures: ITS and changing transportation institutions Automated Highway Systems- Vehicles in Platoons – Integration of Automated Highway Systems. ITS Programs in the World – Overview of ITS implementations in developed countries, ITS in developing countries

TEXT BOOKS:

1. Fundamentals of intelligent transportation systems planning By Mashrur A. Chowdhury, Adel Wadid Sadek
2. ITS Hand Book 2000: Recommendations for World Road Association (PIARC) by Kan Paul Chen, John Miles.

REFERENCES:

1. Sussman, J. M., Perspective on ITS, Artech House Publishers, 2005.
2. National ITS Architecture Documentation, US Department of Transportation, 2007

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DEPARTMENT OF CIVIL ENGINEERING

HC(TE)	HONOR COURSE (TE)	L	T	P	C
		3	1	0	4
(c) RAILWAY, HARBOUR AND AIRPORT ENGINEERING					

Course Learning Objectives:

The objectives of this course are:

1. To know various components and their functions in a railway track
2. To acquire design principles of geometrics in a railway track.
3. To know various techniques for the effective movement of trains.
4. To acquire design principles of airport runway geometrics and pavements.
5. To know the planning, construction and maintenance of Docks and Harbours.

Course Outcomes:

At the end of course, Student will be able to

a. Design geometrics in a railway track.
b. Plan track layouts and control movement of trains
c. Design airport geometrics and airfield pavements.
d. Plan, construct and maintain Docks and Harbours.

Course Articulation Matrix:

	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	PSO 3
CO 1	3	-	1	1	-	1	1	-	-	-	-	1	1	2	3
CO 2	3	3	1	2	-	1	1	-	-	-	-	1	2	1	3
CO 3	3	3	3	2	3	1	1	-	-	-	-	1	2	-	3
CO 4	3	3	3	3	2	2	2	-	-	-	-	1	-	1	3
CO 5	3	3	1	2	-	1	1	-	-	-	-	1	2	1	3

1 - Slightly 2 - Moderately 3 – Substantially

SYLLABUS:

A. RAILWAY ENGINEERING

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 – Signalling systems – Mechanical signalling system – Electrical signalling system – System for Controlling Train Movement – Interlocking – Modern signalling Installations.

B. AIRPORT ENGINEERING

UNIT – IV

Airport Planning & Design: Airport Master plan – Airport site selection – Air craft characteristics – Zoning laws – Airport classification – Runway orientation – Wind rose diagram – Runway length – Taxiway design – Terminal area and Airport layout – Visual aids and Air traffic control.

Runway Design: Various Design factors – Design methods for Flexible pavements – Design methods for Rigid pavements – LCN system of Pavement Design – Airfield Pavement Failures – Maintenance and Rehabilitation of Airfield pavements – Evaluation & Strengthening of Airfield pavements – Airport Drainage – Design of surface and subsurface drainage.

C. DOCKS & HARBOURS

UNIT – V

Planning, Layout, Construction and Maintenance of Docks and Harbours: Classification of ports – Requirement of a good port – classification of Harbours – Docks - Dry & wet docks – Transition sheds and workhouses – Layouts; Quays – construction of Quay walls – Wharves – Jetties – Tides - Tidal data and Analysis – Break waters – Dredging – Maintenance of Ports and Harbours – Navigational aids.

TEXT BOOKS:

1. Railway Engineering by Satish Chandra and Agarwal M.M., Oxford University Press, New Delhi
2. Airport Engineering by Khanna & Arora - Nemchand Bros, New Delhi.
3. Docks and Harbour Engineering by Bindra S.P. - Dhanpathi Rai & Sons, New Delhi.

REFERENCES:

1. ‘Railway Engineering’ by Saxena & Arora - Dhanpat Rai, New Delhi.
2. ‘Transportation Engineering Planning Design’ by Wright P.H. & Ashfort N.J. - John Wiley & Sons.
3. ‘Airport Engineering’ by Virendra Kumar, Dhanpat Rai Publishers, New Delhi.
4. ‘Transportation Engineering’ by Srinivasa Kumar R, University Press, Hyderabad
5. ‘Highway, Railway, Airport and Harbour Engineering’ by Subramanian KP, Scitech Publications (India) Pvt Limited, Chennai

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DEPARTMENT OF CIVIL ENGINEERING

HC(TE)	HONOR COURSE (TE)	L	T	P	C
		3	1	0	4
d) PAVEMENT MANAGEMENT SYSTEM					

Course Learning Objectives:

1. To know various components and functions of pavement management systems
2. To know various pavement serviceability concepts and deterioration models
3. To know various functional and structural evaluation methods
4. To study design alternatives, rehabilitation and maintenance of pavements
5. To study the role of expert systems in pavement management

Course Outcomes:

At the end of the course, student will be able to

a) Understand the features and functions of pavement management systems
b) Asses pavement performance by observing different models
c) Evaluate the pavement functionally and structurally
d) Identify and select suitable design strategies and decide the maintenance and rehabilitation measures required for a given pavement
e) Acquire knowledge of expert systems for managing pavements

SYLLABU

S UNIT-I

PMS Concepts and Components: Definition -Components of Pavement Management Systems, Essential features. Pavement Management Levels and functions: Ideal PMS- Network and Project levels of PMS- Influence Levels- PMS Functions- Function of Pavement evaluation.

UNIT-II

Pavement Performance: Serviceability Concepts- roughness-Roughness Components-Equipment-IRI -modeling techniques, structural condition deterioration models, mechanistic and empirical models, HDM and other models, comparison of different deterioration models.

UNIT-III

Pavement Evaluation:

Functional Evaluation: Functional and Structural deterioration models, unevenness prediction models and other models, comparison, Case studies, Equipment.

Structural Evaluation: Basics- NDT and Analysis—Condition Surveys-Distress-Destructive Structural Analysis- Application in Network and Project Levels

UNIT-IV

Design Alternatives, Rehabilitation and Maintenance: Design objectives and constraints, basic structural response models, physical design inputs, alternate pavement design strategies and economic evaluation, life cycle costing, analysis of alternate pavement strategies based on distress and performance, case studies. Equipment's, Identification of Alternatives-Deterioration Modeling- Priority Programming Methods.

UNIT-V

Expert Systems and Pavement Management: Role of computers in pavement management, applications of expert systems for managing pavements, expert system for pavement evaluation and rehabilitation, knowledge-based expert systems, case studies.

TEXT BOOKS:

1. Ralph Haas and Ronald W. Hudson, 'Pavement Management System', McGraw Hill Book Co. 1978
2. Ralph Haas, Ronald Hudson Zanieswki. 'Modern Pavement Management, Kreiger Publications.

REFERENCES:

1. Proceedings of North American Conference on Managing Pavement.
2. Proceedings of International Conference on Structural Design of Asphalt Pavements NCHRP, TRR and TRB Special Reports

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		L	T	P	C
HC(TE)	HONOR COURSE (TE)	3	1	0	4

e) URBAN TRANSPORTATION PLANNING

Course Learning Objectives:
The objectives of this course are:

1. To appreciate urban transportation problems and procedures for travel demand estimation
2. To appreciate data collection techniques for OD data.
3. To estimate trip generation, trip distribution, mode choice and traffic assignment.
4. To develop alternative urban transport network plans

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

a. Estimate travel demand for an urban area
b. Plan the transportation network for a city
c. Identify the corridor and plan for providing good transportation facilities.
d. Evaluate various alternative transportation proposals

SYLLABUS:

UNIT -I

Urban Transportation Problems & Travel Demand: Urban Issues, Travel Characteristics, Evolution of Planning Process, Supply and Demand – Systems approach; Trends, Overall Planning process, Long term Vs Short term planning, Demand Function, Independent Variables, Travel Attributes, Assumptions in Demand Estimation, Sequential, and Simultaneous Approaches, Aggregate and Disaggregate Techniques.

UNIT -II

Data Collection and Inventories: Collection of data – Organisation of surveys and Analysis, Study Area, Zoning, Types and Sources of Data, Road Side Interviews, Home Interview Surveys, Commercial Vehicle Surveys, Sampling Techniques, Expansion Factors, Accuracy Checks, Use of Secondary Sources, Economic data – Income – Population – Employment – Vehicle Owner Ship.

UNIT -III

Trip Generation & Distribution: UTPS Approach, Trip Generation Analysis: Zonal Models, Category Analysis, Household Models, Trip Attraction models, Commercial Trip Rates; Trip Distribution: Growth Factor Methods, Gravity Models, Opportunity Models, Time Function Iteration Models.

UNIT -IV

Mode Choice Analysis: Mode Choice Behaviour, Competing Modes, Mode Split Curves, Aggregate and Disaggregate Approaches; Discrete Choice Analysis, Choice sets, Maximum Utility, Probabilistic Models: Binary Logit, Multinomial Logit Model – IIA property; Aggregation.
Traffic Assignment: Diversion Curves; Basic Elements of Transport Networks, Coding, Route Properties, Path Building Criteria, Skimming Tree, All-or-Nothing Assignment, Capacity Restraint Techniques, Reallocation of Assigned Volumes, Equilibrium Assignment.

UNIT -V

Corridor Identification, Plan Preparation & Evaluation: Master plans, Selection of Corridor, Corridor Identification, Corridor deficiency Analysis; Travel Forecasts to Evaluate Alternative Improvements, Impacts of New Development on Transportation Facilities. Pivot Point Analysis, Environmental and Energy Analysis; Case studies.

TEXT BOOKS:

1. 'Introduction to Urban System Planning' by Hutchinson, B.G., McGraw Hill.
2. 'Transportation Engineering - An Introduction' by Khisty C.J., Prentice Halls
3. 'Fundamentals of Transportation Planning' by Papacostas, Tata McGraw Hill

REFERENCES:

1. 'Urban Transportation Planning: A Decision Oriented Approach' by Mayer M and Miller E, McGraw Hill
2. 'Introduction to Transportation Planning' by Bruton M.J., Hutchinson of London.
3. 'Metropolitan Transportation Planning' by Dicky, J.W., Tata McGraw Hill
4. 'Traffic Engineering and Transportation Planning' by Kadiyali L.R., Khanna Publishers, New Delhi.

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HC(CT&M)	HONOR COURSE (CT&M)	T	P	C
		3	1	0	4

a) CONSTRUCTION TECHNOLOGY AND MANAGEMENT

Course Learning Objectives:
The objective of this course is:

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

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

1. appreciate the importance of construction planning
2. understand the functioning of various earth moving equipment
3. know the methods of production of aggregate products and concreting
4. apply the gained knowledge to project management and construction techniques

Course Articulation Matrix:

	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	PSO 3
CO 1	-	2	-	-	3	2	2	3	-	-	-	-	-	-	-
CO 2	-	-	-	-	3	2	2	3	-	-	-	-	-	-	-
CO 3	-	-	-	-	3	-	-	3	-	-	-	-	-	-	-
CO 4	-	-	-	-	3	3	-	3	-	-	-	-	-	-	-
CO 5	-	-	-	-	3	-	-	-	-	-	-	-	-	-	-

1 - Slightly 2 - Moderately 3 – Substantially

SYLLABUS:
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

UNIT -II
Project evaluation and review technique – cost analysis - updating – crashing for optimum cost – crashing for optimum resources – allocation of resources introduction to softwares for construction management, project management using PRIMAVERA (or) equivalent.

UNIT- III
Construction equipment – economical considerations – earthwork equipment – Trucks and handling

equipment – rear dump trucks – capacities of trucks and handling equipment – calculation of truck production – compaction equipment – types of compaction rollers Hoisting and earthwork equipment – hoists – cranes – tractors - bulldozers – graders – scrapers– draglines - clamshell buckets

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UNIT -IV

Concreting equipment — concrete mixers – Batching plants, mobile using plants like "Ajax" etc. 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.
BIM for Civil Engineers (Building Information Modelling)

TEXT BOOKS:

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

REFERENCES:

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

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HC(CT&M)	HONOR COURSE (CT&M)	T	P	C
		3	1	0	4

b) ARCHITECTURE AND TOWN PLANNING

Course Learning Objectives:

The objectives of this course are:

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, and 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 the successful completion of this course, the student should be able to:

a. Distinguish architectural styles of eastern and western world.
b. Understand the importance of Orders of architecture.
c. Compose spaces of buildings using design concepts, planning principles.
d. Understand the town planning standards, landscaping features and regulations controlling expansion of the towns and the cities.

Course Articulation Matrix:

	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	PSO 3
CO 1	3	-	-	-	-	1		-	-	2		-	2	-	-
CO 2	2	2	3	3	3	-	2	-	-	2	2	-	1	-	-
CO 3	-	2	2	2	2	-	2	2	1	-	2	-	-	3	2
CO 4	2	1	-	2	2	2	-	-	2		2	2	-	2	2
CO 5	2	2	3	3	3	-	2	-	-	2	2	-	1	-	-

1 - Slightly 2 - Moderately 3 – Substantially

SYLLABUS:

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, Bhubaneshwar, 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 Wrigt, 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, Mohenjo-Daro, Pataliputra, Delhi, Acropolis (Greece), Jerusalem, Mecca, Rome, London.

UNIT – IV

Modern Town Planning: Zoning- Roads and road traffic- Housing- Slums, Parks, Play grounds- Public 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.

TEXTBOOKS:

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.

REFERENCES:

1. 'Drafting and Design for Architecture' by Hepler, CengageLearning
2. 'Architect's Portable Handbook' by John Patten Guthrie – McGrawHill International Publications.
3. 'Modern Ideal Homes for India' by R. S.Deshpande.
4. 'Town and County Planning' by A.J.Brown and H.M.Sherrard.
5. 'Town Design' by Frederik Glbbard, Architectural press, London.

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HC(CT&M)	HONOR COURSE (CT&M)	T	P	C
	3	1	0	4

c) REPAIR AND MAINTENANCE OF STRUCTURES

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

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

Mapping of Course Outcomes with Program Outcomes:

Course Out Comes	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	--	1	--	1	--	1	--
CO2	--	1	1	1	--	1	1
CO3	--	1	1	1	--	1	1
CO4	--	--	1	1	--	1	1
CO5	--	--	1	1	--	1	1
CO6	--	--	1	1	--	1	1
C07	--	--	--	2	--	1	1

1. **Slightly 2. Moderately 3. Substantially**

Detailed Syllabus:

UNIT: 1

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

UNIT: II

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

UNIT: III

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

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UNIT: III

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

UNIT: V

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

TEXT BOOKS:

1. Maintenance Repair Rehabilitation & Minor works of Buildings- P.C. Varghese, PHI Publications
2. Repair and Rehabilitation of Concrete Structures — P.I. Modi, C.N. Patel, PHI Publications
3. Rehabilitation of Concrete Structures- B. Vidivelli, Standard Publishers Distributors
4. Concrete Bridge Practice Construction Maintenance & Rehabilitation- V.K. Raina, Shroff Publishers and Distributors.

REFERENCE:

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

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HC(CT&M)	HONOR COURSE (CT&M)	L	T	P	C
		3	1	0	4
d) DISASTER MANAGEMENT AND MITIGATION					

Course Learning Objectives:
The objective of this course is:

1. Develop an understanding of why and how the modern disaster manager is involved with pre- disaster and post-disaster activities.
2. Develop an awareness of the chronological phases of natural disaster response and refugee relief operations. Understand how the phases of each are parallel and how they differ.
3. Understand the 'relief system' and the 'disaster victim.'
4. Describe the three planning strategies useful in mitigation.
5. Identify the regulatory controls used in hazard management.
6. Describe public awareness and economic incentive possibilities.
7. Understand the tools of post-disaster management.

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

a. Affirm the usefulness of integrating management principles in disaster mitigation work
b. Distinguish between the different approaches needed to manage pre- during and post-disaster periods
c. Explain the process of risk management
d. Relate to risk transfer

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	1	2	2	2	2	1	2	2	-	-	1	-	-
CO2	1	2	2	1	2	2	2	2	2	1	-	-	-	-	2
CO3	1	2	2	1	2	1	2	2	1	-	-	1	-	-	1
CO4	1	2	2	2	3	2	3	1	3	1	2	1	-	-	1
CO5	1	2	2	1	2	1	2	2	1	-	-	1	-	-	1

1 - Slightly 2 - Moderately 3 – Substantially

SYLLABUS:

UNIT-I

Natural Hazards and Disaster Management: Introduction of DM – Inter disciplinary nature of the subject– Disaster Management cycle – Five priorities for action. Case study methods of the following: Vegetal Cover floods, droughts – Earthquakes – landslides – global warming, cyclones & Tsunamis – Post Tsunami hazards along the Indian coast.

UNIT-II

Man Made Disaster and Their Management Along With Case Study Methods Of The Following: Fire hazards – transport hazard dynamics – solid waste management – post disaster – bio terrorism -threat in mega cities, rail and aircraft accidents, ground water, industries - Emerging infectious diseases and Aids and their management.

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UNIT-III

Risk and Vulnerability: Building codes and land use planning – Social Vulnerability – Environmental vulnerability – Macro-economic management and sustainable development, Climate change risk rendition – Financial management of disaster – related losses.

UNIT-IV

Role of Technology in Disaster Managements: Disaster management for infra structures, taxonomy of infra structure – treatment plants and process facilities-electrical substations- roads and bridges- mitigation programme for earth quakes – flowchart, geospatial information in agriculture drought assessment - Multimedia Technology in disaster risk management and training - Transformable Indigenous Knowledge in disaster reduction – Role of RS & GIS.

UNIT-V

Multi-sectional Issues, Education and Community Preparedness: Impact of disaster on poverty and deprivation - Climate change adaptation and human health - Exposure, health hazards and environmental risk-Forest management and disaster risk reduction -The Red cross and red crescent movement - Corporate sector and disaster risk reduction- Education in disaster risk reduction- Essentials of school disaster education - Community capacity and disaster resilience-Community based disaster recovery - Community based disaster management and social capital-Designing resilience- building community capacity for action.

TEXT BOOKS:

1. An Introduction of Disaster Management- Natural Disasters & Vulnerable Hazards– S.Vaidyanathan: CBS Publishers & Distributors Pvt. Ltd.
2. Natural Hazards & Disaster Management, Vulnerability and Mitigation by RB Singh-Rawat Publications
3. ‘Disaster Science & Management’ by Tushar Bhattacharya, Tata McGraw Hill Education Pvt. Ltd., New Delhi.
4. ‘Disaster Management – Future Challenges and Opportunities’ by Jagbir Singh (2007), I K International Publishing House Pvt. Ltd.

REFERENCE BOOKS:

1. ‘Disaster Management’ edited by H K Gupta (2003), Universities press.
2. ‘Disaster Management – Global Challenges and Local Solutions’ by Rajib shah & R R Krishnamurthy (2009), Universities press.
3. R. Nishith, Singh AK, “Disaster Management in India: Perspectives, Issues and strategies” New Royal Book Company.”

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HC(CT&M)	HONOR COURSE (CT&M)	L	T	P	C
		3	1	0	4
e) PRECAST AND PREFABRICATED STRUCTURES					

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

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

Mapping of course outcomes with program outcomes:

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6
CO1	2	1	2	3	2	1
CO2	2	1	1	3	2	1
CO3	2	1	2	3	3	1
CO4	2	1	1	3	3	1

1. **Slightly 2. Moderately 3. Substantially**

Detailed Syllabus:

UNIT -I

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

UNIT -II

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

UNIT -III

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

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UNIT -IV

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

UNIT -V

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

TEXT BOOKS

1. CBRI, Building materials and components, India, 1990
2. Gerostiza C.Z., Hendrikson C. and Rehat D.R., Knowledge based process planning for construction and manufacturing, Academic Press Inc., 1994
3. Koncz T., Manual of precast concrete construction, Vols. I, II and III, Bauverlag, GMBH, 1971.

REFERENCES

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

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MINOR COURSES – I/III

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MC -I/III	MINOR COURSE	L	T	P	C
		3	1	0	4
a) ENVIRONMENTAL ENGINEERING AND MANAGEMENT					

Course Learning Objectives:
The course will address the following:

1. Outline planning and the design of water supply systems for a community/town/city
2. Provide knowledge of air pollution control with various methods
3. Impart understanding of importance of protection of water source quality and enlightens the efforts involved in converting raw water into clean potable water.
4. Selection of valves and fixture in water distribution systems
5. Impart knowledge on Industrial Wastewater management
6. Visit atleast one Water and Wastewater Treatment Plant and supply system.

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

1. Plan and design the water and wastewater systems
2. Identify the source of emissions and select proper control systems
3. Design & estimation of water supply system for a city
4. to get knowledge about various environmental spects
5. Selection of suitable treatment flow for raw water treatments

Course Articulation Matrix:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
CO 1	2	1	1	1	1	3	1	1	-	-	-	1	-	-	-
CO 2	3	3	3	1	2	3	1	1	-	-	-	1	-	-	2
CO 3	3	3	3	1	2	3	1	1	-	-	-	1	-	-	2
CO 4	2	1	1	1	1	3	2	1	-	-	-	1	-	-	-
CO 5	3	3	3	1	2	3	1	1	-	-	-	1	-	-	2

1 - Slightly 2 - Moderately 3 – Substantially

SYLLABUS:

UNIT I

Industrial wastes and their sources: Various industrial processes, Sources and types of solid, liquid, gaseous wastes, Noise & radiation emissions. Sources of industrial water usages and various industrial processes requiring water use and required water quality. Green Audit, Introduction to ISO and ISO 14000. Green Audit

UNIT II

Processes responsible for deterioration in water quality, various waste water streams, Control and removal of specific pollutants in industrial wastewaters, e.g., oil and grease, bio-degradable organics, chemicals such as cyanide, fluoride, toxic organics, heavy metals, radioactivity etc. Wastewater reuse & recycling, concept of zero discharge effluent.

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UNIT III

Control of gaseous emissions: Hood and ducts, Tall stacks, Particulate and gaseous pollutant control, Solid waste generation and disposal management. Hazardous wastes: Definitions, concepts and management aspects. Noise & radiation: Generation, control and management.

UNIT IV

Recent trends in industrial waste management, Cradle to grave concept, Life cycle analysis, Clean technologies; Case studies of various industries, e.g., dairy, fertilizer, distillery, sugar, pulp and paper, iron and steel, metal plating, thermal power plants, etc. Environmental audit: Definition and concepts, Environmental audit versus accounts audit, Compliance audit, relevant methodologies, various pollution regulations,

UNIT V

Study and significance of natural resources, Renewable biological resources, Wildlife conservation/ management, Fisheries, Forestry, Energy resources, Energy consumption, Scarcity and conservation. Acts and case studies

Text Books:

1. Metcalf & Eddy “Wastewater Engineering: Treatment & Reuse”, Tata Mc Graw Hill.
2. KVSG Murali Krishna “Industrial Wastewater Management”, Paramount Publications, Hyderabad.
3. Birdie GS & Birdie JS, “Water Supply and Sanitary Engineering”.
4. Environmental Engineering by Peavy Rowe, Tehobonoglous.

References:

Industrial Wastewater Treatment by MN Rao and AK Dutta, Oxford & IBH

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MC -I/III	MINOR COURSE	L	T	P	C
		3	1	0	4
b) SOLID MECHANICS					

Course Outcomes:
At the end of this course the student will be able to-
1. Describe the concepts and principles of stresses and strains
2. Analyze solid mechanics problems using classical methods and energy methods
3. Analyze structural members subjected to combined stresses
4. Calculate the deflections at any point on a beam subjected to a combination of loads
5. Understand the behavior of columns, springs and cylinders against loads.

SYLLABUS:
UNIT I : Simple stress and strains:
Concept of stress and strain, types of stresses and strains, Hook's law, stress and strain diagram for ductile and brittle metal. Lateral strain, Poission ratio, volumetric strain, elastic moduli and relation between them. Bar of varying cross section, composite bar and temperature stress. Strain energy for gradual, sudden and impact loading. Compound stress and strains: Normal stress and strain, shear stress and strain, stresses on inclines sections, principal stress and strain, maximum shear stress, Mohr's stress circle, three dimensional state of stress & strain, equilibrium equations, generalized Hook's law-3D, Theories of failure and factor of safety. [8 Hours]

UNIT II: Shear force and bending moment diagrams
Shear force (SF) and Bending moment (BM) diagrams for simply supported, cantilevers, overhanging and fixed beams. Calculation of maximum BM and SF and the point of contra flexure under concentrated loads, uniformly distributed loads over the whole span or part of span, combination of concentrated loads (two or three) and uniformly distributed loads, uniformly varying loads. [8 Hours]

UNIT III : Flexural Stresses-Theory of simple bending – Assumptions – Derivation of bending equation: M/I = f/y = E/R - Neutral axis – Determination of bending stresses – Section modulus of rectangular and circular sections (Solid and Hollow), I,T, Angle and Channel sections – Design of simple beam sections. Torsion- Derivation of torsion equation and its assumptions. Applications of the equation of the hollow and solid circular shafts, torsional rigidity, Combined torsion and bending of circular shafts, principal stress and maximum shear stresses under combined loading of bending and torsion. Shear Stresses- Derivation of formula – Shear stress distribution across various beam sections like rectangular, circular, triangular, I, T angle sections. [8 Hours]

UNIT IV : Deflection of Beams:
Slope and deflection- Relationship between moment, slope and deflection, Moment area method, Macaulay's method. Use of these methods to calculate slope and deflection for determinant beams. Short Columns and Struts: Buckling and stability, slenderness ratio, combined bending and direct stress, middle third and middle quarter rules. [8 Hours]

UNIT V: Helical and Leaf Springs
Deflection of springs by energy method, helical springs under axial load and under axial twist (respectively for circular and square cross sections) axial load and twisting moment acting simultaneously both for open and closed coiled springs. Thin cylinders, Thick cylinders & Spheres: Introduction, difference between thin walled and thick walled pressure vessels, thin walled spheres and cylinders, hoop and axial stresses and strain, volumetric strain. Radial, axial and circumferential stresses in thick cylinders subjected to internal or

external pressures, compound cylinders. [8 Hours]

Books and References:

1. Mechanics of Materials by Hibbeler, Pearson.
2. Mechanics of material by Gere, Cengage Learning
3. Mechanics of Materials by Beer, Jhonston, DEwolf and Mazurek, MCGRAW HILL INDIA
4. Strength of Materials by Pytel and Singer, Harper Collins
5. Strength of Materials by Ryder, Macmillan.
6. Strength of Materials by Timoshenko and Yσungs, East West Press.
7. Introduction to Solid Mechanics by Shames, Pearson
8. Mechanics of material by Pytel, Cengage Learning
9. An Introduction to Mechanics of Solids by Crandall, MCGRAW HILL INDIA
10. Strength of Materials by Jindal, Pearson Education
11. Strength of Materials by R. Subramanian, Oxford University Press, New Delhi.
12. Kazmi, S. M. A., “Solid Mechanics” TMH, Delhi, India

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MC -I/III	MINOR COURSE	L	T	P	C
		3	1	0	4
c) IRRIGATION ENGINEERING					

COURSE OUTCOMES:

Students will be able to

- CO1 Have knowledge and skills on crop water requirements.
- CO2 Understand the methods and management of irrigation.
- CO3Gain knowledge on types of Impounding structures
- CO4 Understand methods of irrigation including canal irrigation.
- CO5 Get knowledge on water management on optimization of water use.

OBJECTIVE:

 The student is exposed to different phases in irrigation practices and Planning and management of irrigation. Further they will be imparted required knowledge on Irrigation storage and distribution canal system and Irrigation management.

UNIT I: CROP WATER REQUIREMENT

Need and classification of irrigation- historical development and merits and demerits of irrigation types of crops-crop season-duty, delta and base period- consumptive use of crops- estimation of Evapotranspiration using experimental and theoretical methods.

UNIT II: IRRIGATION METHODS

Tank irrigation – Well irrigation – Irrigation methods: Surface and Sub-Surface and Micro Irrigation – design of drip and sprinkler irrigation – ridge and furrow irrigation-Irrigation scheduling – Water distribution system- Irrigation efficiencies.

UNIT III: DIVERSION AND IMPOUNDING STRUCTURES

Types of Impounding structures - Gravity dam – Forces on a dam -Design of Gravity dams; Earth dams, Arch dams- Diversion Head works - Weirs and Barrages.

UNIT IV CANAL IRRIGATION

Canal regulations – direct sluice - Canal drop – Cross drainage works-Canal outlets – Design of prismatic canal-canal alignments-Canal lining - Kennedy’s and Lacey’s Regime theory-Design of unlined canal.

UNIT V WATER MANAGEMENT IN IRRIGATION

Modernization techniques- Rehabilitation – Optimization of water use-Minimizing water losses- On form development works-Participatory irrigation management- Water resources associations changing paradigms in water management-Performance evaluation-Economic aspects of irrigation.

TEXTBOOKS:

1. Dilip Kumar Majumdar, "Irrigation Water Management", Prentice-Hall of India, New Delhi, 2008.
2. Punmia B.C., et. al; Irrigation and water power Engineering, Laxmi Publications, 16th Edition, New Delhi, 2009
3. Garg S. K., "Irrigation Engineering and Hydraulic structures", Khanna Publishers, 23rd Revised Edition, New Delhi, 2009

REFERENCES:

1. Duggal, K.N. and Soni, J.P., "Elements of Water Resources Engineering", New Age International Publishers, 2005
2. Linsley R.K. and Franzini J.B, "Water Resources Engineering", McGraw-Hill Inc, 2000
3. Chaturvedi M.C., "Water Resources Systems Planning and Management", Tata McGrawHill Inc., New Delhi, 1997.
4. Sharma R.K.. "Irrigation Engineering", S.Chand & Co. 2007.
5. Michael A.M., Irrigation Theory and Practice, 2nd Edition, Vikas Publishing House Pvt. Ltd., Noida, Up, 2008
6. Asawa, G.L., "Irrigation Engineering", NewAge International Publishers, New Delhi, 2000.
7. Basak, N.N, "Irrigation Engineering", Tata McGraw Hill Publishing Co. New Delhi1999 CE8604 HIGHWAY ENGINEERING L T P

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MC -I/III	MINOR COURSE	L	T	P	C
		3	1	0	4
d) GEO INFORMATICS					

COURSE OUTCOMES:
CO 1: Understand the basic of Geodesy and Indian Geodetic System
CO 2: Analyze and understand the basic of GPS. and data processing
CO 3: Analyze and understand the basic of Differential GPS (DGPS).
CO 4: Analyze and understand different application of GPS.
CO 5: Develop and execute GPS & DGPS related project.
SYLLABUS

UNIT I:
Introduction to Geodesy: Definitions and fundamentals of Geodesy, Earth, Geoid and Ellipsoid of rotation, Reference surface, Geodetic systems, Indian Geodetic System, Coordinate systems in Geodesy.

UNIT II:
Fundamentals of GPS: Introductions, Space segment, User segment and Control segments, Observation principle and signal structure, Orbit determination and representation, Intentional limitation of system accuracy, system development, Point positioning and relative positioning. GPS Receivers: Receiver Concepts and main receiver components, Examples of GPS receivers, Classical receivers, Examples of currently available geodetic receivers, Navigational receivers, Future developments.

UNIT III:
GPS Observables and Data Processing: Code and carrier phase observables, Linear combinations and derived observables, Concepts of parameterization, Solutions of ambiguity, Cycle slips, Receiver independent exchange data format-RINEX . Methods of surveying with GPS: Static, Pseudo-kinematic, Semi-kinematic and Kinematic positioning, Navigation with GPS.

UNIT IV:
Differential GPS: DGPS Concepts, Data Formats, Data Transmission, Real Time Kinematic GPS, Multiple reference stations. Erro Budget and Corrections: Basic considerations, Satellite geometry, Accuracy measures, Orbits and clocks, Signal propagation, Tropospheric and Ionospheric effects, Multipath, Summary and issue of integrity.

UNIT V:
GPS Applications: Setting up an observation plan, Practical aspects of field observations, Observation strategies, Network design, Geodetic control survey of zero 1st, 2nd, 3rd & 4th order. Height determination, Cadastral Surveying. GIS.

TEXT BOOKS:
1. Satellite Geodesy by GUNTER SEEBER, copy Right 2003 by WALTER DE GRUYTER 1993, ISBN: 3-11-017549-5.
2. Global Positioning system – Theory and Practice – Hofmann W.B, Lichtenegger. H, Collins. J-Springer Verlag Wein, New York.

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MINOR COURSES – II/IV

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MC -II/IV	MINOR COURSE	L	T	P	C
		3	1	0	4
A) CONSTRUCTION TECHNOLOGY AND INFRASTRUCTURE MANAGEMENT					

Course Learning Objectives:

The objective of this course is:

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

Course Outcomes:

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

1. Appreciate the importance of construction planning.
2. Understand the functioning of various earth moving equipment.
3. Know the methods of production of aggregate products and concreting.
4. Apply the gained knowledge to project management and construction techniques.

Course Articulation Matrix:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
CO1	-	2	-	-	3	2	2	3	-	-	-	-	-	-	-
CO2	-	-	-	-	3	2	2	3	-	-	-	-	-	-	-
CO3	-	-	-	-	3	-	-	3	-	-	-	-	-	-	-
CO4	-	-	-	-	3	3	-	3	-	-	-	-	-	-	-
CO5	-	-	-	-	3	-	-	-	-	-	-	-	-	-	-

1 - Slightly 2 - Moderately 3 – Substantially

SYLLABUS:

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

UNIT -II

Project evaluation and review technique – cost analysis - updating – crashing for optimum cost – crashing for optimum resources – allocation of resources introduction to softwares for construction management, project management using PRIMAVERA (or) equivalent.

UNIT- III

Construction equipment – economical considerations – earthwork equipment – Trucks and handling equipment – rear dump trucks – capacities of trucks and handling equipment – calculation of truck production – compaction equipment – types of compaction rollers Hoisting and earthwork equipment – hoists – cranes – tractors - bulldozers – graders – scrapers– draglines - clamshell buckets.

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UNIT -IV

Concreting equipment — concrete mixers – Batching plants, mobile using plants like "Ajax" etc. 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.
BIM for Civil Engineers (Building Information Modeling)

TEXT BOOKS:

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

REFERENCES:

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

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MC -II/IV	MINOR COURSE	L	T	P	C
		3	1	0	4
b) SEISMOLOGY AND EARTHQUAKE ENGINEERING					

Course Learning Objectives:
The objective of this course is:
1. Familiarize Students with Engineering Seismology
2. Equip student with concepts of Structural Dynamics
3. Understand Concepts of Seismic Design
4. Familiarize with Design philosophies for Seismic loading
5. Familiarize students with various IS codal provisions for ductile design and detailing

Course Outcomes:
At the end of this course the student will be able to
a) Explain fundamentals of Engineering Seismology
b) Acquaint with the principles Structural dynamics
c) Solve SDOF Systems and suggest ductile design
d) Compute equivalent lateral seismic loads and carryout a seismic design as per IS codal provisions

SYLLABUS:

UNIT-I

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

UNIT-II

Introduction to Structural Dynamics: Fundamental objective of Dynamic analysis – Types of prescribed loadings – Formulation of the Equations of Motion– Elements of a Vibratory system – Degrees of Freedom - Oscillatory motion – Simple Harmonic Motion – Free Vibrations of Single Degree of Freedom (SDOF) systems – Undamped and Damped – Critical damping – Logarithmic decrement – Forced vibrations of SDOF systems – Harmonic excitation – Dynamic magnification factor.

UNIT-III

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

UNIT-IV

Calculation of equivalent lateral force- Design Base Shear- Storey Shear, Estimation of Natural period of Structure, Computation of Response acceleration Coefficient- Zone factor- Seismic weight- Response reduction factors- Seismic Coefficient Method.

UNIT-V

Design and ductile detailing of Beams and columns of frames -Concept of strong column weak beams, Ductility criteria for earthquake resistant design, Ductile detailing of flexural members as per IS 13920- Longitudinal reinforcement, Shear reinforcement, Anchorage of reinforcement Development length, Lap Splices. Seismic Analysis and design of simple 2-storied RC Building frame – Equivalent static lateral force method and response spectrum method.

TEXT BOOK

1. 'Earthquake Resistant Design of Structures' -Pankaj Agarwal and Manish ShriKhande, Prentice – Hall of India, 2007, New Delhi.
2. 'Earthquake Resistant Design of Building Structures' by Vinod Hosur, Wiley India Ltd.
3. 'Reinforced Concrete Design'by A. K. Jain.

REFERENCES

1. 'Introduction to the Theory of Seismology' by Bullen K.E., Great Britain at the University Printing houses, Cambridge University Press 1996.
2. Relevant code of practices.

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MC -II/IV	MINOR COURSE	L	T	P	C
		3	1	0	4
c) RAILWAY, HARBOUR AND AIRPORT ENGINEERING					

Course Learning Objectives:

The objectives of this course are:

1. To know various components and their functions in a railway track
2. To acquire design principles of geometrics in a railway track.
3. To know various techniques for the effective movement of trains.
4. To acquire design principles of airport runway geometrics and pavements.
5. To know the planning, construction and maintenance of Docks and Harbours.

Course Outcomes:

At the end of course, Student will be able to

a) Design geometrics in a railway track.
b) Plan track layouts and control movement of trains
c) Design airport geometrics and airfield pavements.
d) Plan, construct and maintain Docks and Harbours.

Course Articulation Matrix:

	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	PSO 3
CO 1	3	-	1	1	-	1	1	-	-	-	-	1	1	2	3
CO 2	3	3	1	2	-	1	1	-	-	-	-	1	2	1	3
CO 3	3	3	3	2	3	1	1	-	-	-	-	1	2	-	3
CO 4	3	3	3	3	2	2	2	-	-	-	-	1	-	1	3
CO 5	3	3	1	2	-	1	1	-	-	-	-	1	2	1	3

1 - Slightly 2 - Moderately 3 – Substantially

SYLLABUS:

A. RAILWAY ENGINEERING

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 – Signalling systems – Mechanical signalling system – Electrical signalling system – System for Controlling Train Movement – Interlocking – Modern signalling Installations.

B. AIRPORT ENGINEERING

UNIT – IV

Airport Planning & Design: Airport Master plan – Airport site selection – Air craft characteristics – Zoning laws – Airport classification – Runway orientation – Wind rose diagram – Runway length – Taxiway design – Terminal area and Airport layout – Visual aids and Air traffic control.

Runway Design: Various Design factors – Design methods for Flexible pavements – Design methods for Rigid pavements – LCN system of Pavement Design – Airfield Pavement Failures – Maintenance and Rehabilitation of Airfield pavements – Evaluation & Strengthening of Airfield pavements – Airport Drainage – Design of surface and subsurface drainage.

C. DOCKS & HARBOURS

UNIT – V

Planning, Layout, Construction and Maintenance of Docks and Harbours: Classification of ports – Requirement of a good port – classification of Harbours – Docks - Dry & wet docks – Transition sheds and workhouses – Layouts; Quays – construction of Quay walls – Wharves – Jetties – Tides - Tidal data and Analysis – Break waters – Dredging – Maintenance of Ports and Harbours – Navigational aids.

TEXT BOOKS:

1. Railway Engineering by Satish Chandra and Agarwal M.M., Oxford University Press, New Delhi
2. Airport Engineering by Khanna & Arora - Nemchand Bros, New Delhi.
3. Docks and Harbour Engineering by Bindra S.P. - Dhanpathi Rai & Sons, New Delhi.

REFERENCES:

1. ‘Railway Engineering’ by Saxena & Arora - Dhanpat Rai, New Delhi.
2. ‘Transportation Engineering Planning Design’ by Wright P.H. & Ashfort N.J. - John Wiley & Sons.
3. ‘Airport Engineering’ by Virendra Kumar, Dhanpat Rai Publishers, New Delhi.
4. ‘Transportation Engineering’ by Srinivasa Kumar R, University Press, Hyderabad
5. ‘Highway, Railway, Airport and Harbour Engineering’ by Subramanian KP, Scitech Publications (India) Pvt Limited, Chennai

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
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DEPARTMENT OF CIVIL ENGINEERING

MC -II/IV	MINOR COURSE	L	T	P	C
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d) ARCHITECTURE AND TOWN PLANNING					

Course Learning Objectives:

The objectives of this course are:

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 the successful completion of this course, the student should be able to:

a. Distinguish architectural styles of eastern and western world.
b. Understand the importance of Orders of architecture.
c. Compose spaces of buildings using design concepts, planning principles.
d. Understand the town planning standards, landscaping features and regulations controlling expansion of the towns and the cities.

Course Articulation Matrix:

	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	PSO 3
CO 1	3	-	-	-	-	1		-	-	2		-	2	-	-
CO 2	2	2	3	3	3	-	2	-	-	2	2	-	1	-	-
CO 3	-	2	2	2	2	-	2	2	1	-	2	-	-	3	2
CO 4	2	1	-	2	2	2	-	-	2		2	2	-	2	2
CO 5	2	2	3	3	3	-	2	-	-	2	2	-	1	-	-

1 - Slightly 2 - Moderately 3 – Substantially

SYLLABUS:

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 Wrigt, 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 grounds- Public Utility Services- Surveys and maps for planning- Neighbourhood 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.

TEXTBOOKS:

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, NewDelhi.
4. 'Indian Architecture – Vol. I & II' by Percy Brown, Taraporevala Publications, Bombay.
5. 'Fundamentals of Town Planning' byG.K.Haraskar.

REFERENCES:

1. 'Drafting and Design for Architecture' by Hepler, CengageLearning
2. 'Architect's Portable Handbook' by John Patten Guthrie – McGrawHill International Publications.
3. 'Modern Ideal Homes for India' by R. S.Deshpande.
4. 'Town and County Planning' by A.J.Brown and H.M.Sherrard.
5. 'Town Design' by FederikGlbbard, Architectural press, London.