COURSE STRUCTURE AND SYLLABUS

For

B. TECH CIVIL ENGINEERING

(Applicable for batches admitted from 2019-2020)

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA

KAKINADA - 533 003, Andhra Pradesh, India

I Year – I SEMESTER

Sl. No	Course Code	Subjects	L	T	P	Credits
1	BS1101	Mathematics – I	3	0	0	3
2	HS1101	Communicative English	3	0	0	3
3	BS1102	Engineering Chemistry	3	0	0	3
4	ES1101	Essentials of Electrical and Electronics Engineering	3	1	0	3
5	ES1102	Engineering Graphics	1	0	3	2.5
6	HS1102	English Communication Skills Lab - I	0	0	3	1.5
7	BS1103	Engineering Chemistry Lab	0	0	3	1.5
8	ES1103	Workshop Practice	0	0	2	1
9	ES1104	Essentials of Electrical & Electronics Engineering Lab	0	0	2	1
10	MC1101	Environmental Science	3	0	0	0
11	MC1102	Physical Fitness Activities	3	0	0	0
Total Credits			**16**	**0**	**12**	**19.5**

I Year – II SEMESTER

Sl. No	Course Code	Subjects	L	T	P	Credits
1	BS1201	Mathematics - II	3	0	0	3
2	BS1202	Mathematics – III	3	0	0	3
3	BS1203	Applied/ Engineering Physics	3	0	0	3
4	ES1201	Problem Solving& Programming Using C	3	0	0	3
5	ES1202	Engineering Mechanics	3	0	0	3
6	BS1204	Applied/ Engineering Physics Lab	0	0	3	1.5
7	HS1201	English Communication Skills Lab - II	0	0	3	1.5
8	BS1205	Physic Virtual Lab	0	0	2	0
9	ES1203	Problem Solving & Programming using C Lab	0	0	3	1.5
10	PR1201	Engineering Exploration Project & Design Thinking (15hrs per sem)	3	0	0	0.5
11	MC1201	Constitution of India	3	0	0	0
Total Credits			**15**	**0**	**11**	**20**

II YEAR: I- SEMESTER

Sl. No.	Course Code	Course Title	L	T	P	Credits
1	BS2101	Probability and Statistics/ M4	3	0	0	3
2	PC2101	Strength of Materials	3	0	0	3
3	PC2102	Fluid Mechanics	3	0	0	3
4	ES2101	Surveying	3	0	0	3
5	ES2102	Engineering Geology	3	0	0	3
6	PC2103	Building Materials and Construction	3	0	0	3
7	PC2104	Strength of Materials Lab	0	0	3	1.5
8	ES2103	Surveying Field Work – I	0	0	3	1.5
9	ES2104	Engineering Geology Lab	0	0	3	1.5
		Total Credits				**22.5**

II YEAR: II- SEMESTER

Sl. No.	Course Code	Course Title	L	T	P	Credits
1	PC2201	Transportation Engineering - I	3	0	0	3
2	PC2202	Hydraulics and Hydraulic Machinery	3	0	0	3
3	ES2201	Structural Analysis - I	3	0	0	3
4	PC2203	Building Planning and Drawing	3	0	0	2
5	PC2204	Concrete Technology	3	0	0	2
6	PC2205	Managerial Economics and Financial Analysis	0	0	2	3
7	ES2202	Surveying Field work - II	0	0	3	1.5
8	PC2206	Fluid Mechanics Lab	0	0	3	1.5
9	MC2201	Socially Relevant Projects	0	0	1	0.5
10	MC2202	Essence of Indian Traditional Knowledge/ Professional Ethics and Human Values	2	0	0	0
		Total Credits				**19.5**

III YEAR: I- SEMESTER

Sl. No.	Course Code	Course Title	L	T	P	Credits
1	PC3101	Structural Analysis - II	3	0	0	3
2	PC3102	Design of Reinforced Concrete Structures	2	0	0	3
3	PC3103	Environmental Engineering - I	3	0	0	3
4	PC3104	Geotechnical Engineering - II	3	0	0	3
5	PC3105	Water Resources Engineering - I	3	0	0	3
6	PC3106	Geotechnical Engineering Lab	3	0	0	1.5
7	PC3107	Concrete Technology Lab	0	0	3	1.5
8	PC3108	Hydraulic Machinery Lab	0	0	3	1.5
9	MC3101	Socially Relevant Projects	0	0	1	0.5
		Total Credits				**20**

III YEAR: II- SEMESTER

Sl. No.	Course Code	Course Title	L	T	P	Credits
1	PC3201	Design of Steel Structures	3	0	0	3
2	PC3202	Geotechnical Engineering – II	3	0	0	3
3	PC3203	Transportation Engineering - II	3	0	0	3
4	PE3201 (PE-I)	Construction Technology & Management	3	0	0	3
5	PC3204	Environmental Engineering – II	3	0	0	3
6	OE3201	Open Elective – I	3	0	0	3
7	PC3205	Environmental Engineering Lab	0	0	3	1.5
8	PC3206	Transportation Engineering Lab	0	0	3	1.5
9	PR3201	Indian Traditional Knowledge/ Research Methodology/ Professional Ethics and Human Values	2	0	0	0
		Total Credits				**21**

IV YEAR: I- SEMESTER

Sl. No.	Course Code	Course Title	L	T	P	Credits
1	PC4101	Water Resources Engineering - II	3	0	0	3
2	PE4101 (PE-II)	Estimation Specifications and Contracts	3	0	0	3
3	PE4102 (PE-III)	Remote Sensing & GIS	3	0	0	3
4	PE4103 (PE-IV)	Ground Improvement Techniques	3	0	0	3
5	OE4101	Open Elective – II	3	0	0	3
6	PC4102	GIS & CAD Lab	0	0	3	1.5
7	PC4103	Design & Drawing of Concrete Structures and Steel Structures	0	0	3	1.5
8	PR4101	Industrial Training/ Skill Development Programs/Research Project	0	0	3	1
9		Project Work Phase-I	0	0	0	2
		Total Credits				**21**

IV YEAR: II- SEMESTER

Sl. No.	Course Code	Course Title	L	T	P	Credits
1	PE4201 (PE-V)	Design and Drawing of Irrigation Structures	3	0	0	3
2	PE4202 (PE-VI)	Bridge Engineering	3	0	0	3
3	PE4203 (PE-VII)	Pre-stressed Concrete	3	0	0	3
4	PR4201	Project Work Phase-II	0	0	16	8
		Total Credits				**17**

List of Professional and Open Electives

Open Electives	**Professional Elective-I**	**Professional Elective-II**	**Professional Elective-III**	**Professional Elective-IV**	**Professional Elective-V**	**Professional Elective-VI**	**Professional Elective-VII**
a) Disaster Management	Construction Technology & Management	Estimation Specification & Contracts	Remote Sensing and GIS	Ground Improvement Techniques	Design and Drawing of Irrigation Structures	Bridge Engineering	Pre-stressed Concrete
b) Environmental Pollution & Control	Environmental Impact Assessment	Architecture Town Planning	Disaster Management & Mitigation	Pavement Management Systems	Watershed Management	Finite Element Methods	Advanced Structural Analysis
c) Elements of Civil Engineering	Road Safety Engineering	Traffic Engineering	Earth & Rock fill Dams	Reinforced Soil Structures	Urban Hydrology	Repair & Rehabilitation of Buildings	Low-cost Housing
d) Green Technology	Industrial Wastewater Treatment	Urban Transportation Planning	Geo-Spatial Technologies	Machine Foundations		SWAYAM / NPTEL /MOOCS COURSES (12 weeks duration)	SWAYAM / NPTEL /MOOCS COURSES (12 weeks duration)
e) Smart Cities							
f) Project Management							
g) Wastewater Treatment							
h) Intelligent Transportation Systems							

List of Minor Courses Offered to students

Sl. No.	Course Code	Course Title	L	T	P	Credits
1*		Surveying, RS and GIS	3	0	1	4
2*		Building Materials and Construction	3	0	1	4
3		Geo-Technical Engineering	3	0	1	4
4		Water Resources Engineering	3	0	1	4
5		Transportation Systems	3	0	1	4
6**		Mechanics of Materials	3	0	1	4
7		Structural Analysis	3	0	1	4
8		Public Health Engineering	3	0	1	4
9		Concrete Technology and RCC	3	0	1	4
		Total Credits				**20**

* Marked (1,2) are mandatory.
** marked are not for Mechanical Engineering students

- Out of 9, any 4 may be chosen in addition to two compulsory MOOCS/NPTEL courses of each 2 credits.
- Minimum number of student registrations for running the program – 8.
- In case, the number of students, are below 8, equivalent courses may be suggested by the Chairman, BOS.

List of Honor Courses Offered to students

Sl. No.	Course Code	Course Title – Structural Engineering	L	T	P	Credits
1		Theory of Elasticity	3	0	1	4
2		Pre-Stressed Concrete	3	0	1	4
3		Bridge Engineering	3	0	1	4
4		Finite Element Methods	3	0	1	4
5		Advanced Structural Analysis	3	0	1	4
6		Advanced Reinforced Concrete Design	3	0	1	4
7		Earthquake Resistant Design of Structures	3	0	1	4
8		Repair and Rehabilitation of Structures	3	0	1	4
9		Analysis and Design of Tall Structures	3	0	1	4
10		Precast and Prefabricated Structures	3	0	1	4
		Total Credits				**20**

Sl. No.	Course Code	Course Title – Geo-technical Engineering	L	T	P	Credits
1		Reinforced Soil Structures	3	0	1	4
2		Advanced Foundation Engineering	3	0	1	4
3		Earth and Rock fill Dams	3	0	1	4
4			3	0	1	4
5		Machine Foundations	3	0	1	4
6		Design of Geo Synthetics	3	0	1	4
7		Remote Sensing and GIS	3	0	1	4
8		Pavement Analysis Design and Evaluation	3	0	1	4
9		Finite Element Method	3	0	1	4
10		Numerical Methods in Geo-Technical Engineering	3	0	1	4
		Total Credits				**20**

Sl. No.	Course Code	Course Title – Hydraulics and Water Resources Engineering	L	T	P	Credits
1		Advanced Hydrology	3	0	1	4
2		Advanced Fluid Mechanics	3	0	1	4
3		Water Resources Systems Planning and Management	3	0	1	4
4		Hydraulic Structures	3	0	1	4
5		Design and Drawing of Irrigation Structures	3	0	1	4
6		River Management	3	0	1	4
7		Environmental Impact Assessment of Water Resource Projects	3	0	1	4
8		Urban Hydrology	3	0	1	4
9		Remote Sensing and GIS	3	0	1	4
10		Industrial Wastewater Treatment	3	0	1	4
		Total Credits				**20**

Sl. No.	Course Code	Course Title – Transportation Engineering	L	T	P	Credits
1		Traffic Engineering	3	0	1	4
2		Urban Transportation Engineering	3	0	1	4
3		Intelligent Transport Systems	3	0	1	4
4		Road Safety Engineering	3	0	1	4
5		Pavement Management Systems	3	0	1	4
6			3	0	1	4
7			3	0	1	4
		Total Credits				**20**

Sl. No.	Course Code	Course Title – Construction Technology and Management	L	T	P	Credits
1		Construction technology and Management	3	0	1	4
2		Architecture Town Planning	3	0	1	4
3		Green Buildings	3	0	1	4
4		Disaster Management and Mitigation	3	0	1	4
5		Low-Cost Housing	3	0	1	4
6		Lean Construction	3	0	1	4
7		Valuation and arbitration	3	0	1	4
8		Quality assurance and Quality Control	3	0	1	4
9		Urban Infrastructure Management	3	0	1	4
10			3	0	1	4
		Total Credits				**20**

		L	T	P	C
I Year - I Semester					
		3	**0**	**0**	**3**

Mathematics-I (BS1101)
(Common to all Branch's for I Year B. Tech)

Course Objectives:

This course will illuminate the students in the concepts of calculus.

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.

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)

Non-homogeneous 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.

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 Mc Laurent's series expansion of functions of two variables.
Applications: Maxima and Minima of functions of two variables without constraints and Lagrange's method (with constraints).

UNIT V:
Multiple integrals: (8 hrs)

Double and Triple integrals – Change of order of integration – Change of variables.
Applications: Finding Areas and Volumes.

Text Books:

B. S. Grawal, Higher Engineering Mathematics, 43rdEdition, Khanna Publishers.
B. V. Ramana, Higher Engineering Mathematics, 2007 Edition, Tata Mc. Graw HillEducation.

Reference Books:

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

I Year - I Semester		**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**
COMMUNICATIVE ENGLISH (HS1101)					

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

<u>Unit 1:</u>

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 short audio texts andidentifying the context and specific pieces of information to answer a series of questions both in speaking and writing.

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 toaudio 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 aparagraph together.

Reading for Writing: Summarizing - identifying main idea/s and rephrasing what is read; avoidingredundancies and repetitions.

Vocabulary: Technical vocabulary from across technical branches (20 words). GRE VocabularyAnalogies (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**", MaruthiPublications

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

Listening: Listening for global comprehension and summarizing what is listened to, both in speakingand 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 specificcontext clues; strategies to use text clues for comprehension. Critical reading.

Reading for Writing: Summarizing - identifying main idea/s and rephrasing what is read; avoidingredundancies 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 (20words) (Antonyms and Synonyms, Word applications) Association, sequencing of words

Grammar: Verbs - tenses; subject-verb agreement; direct and indirect speech, reporting verbs foracademic 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",** PearsonPublications**.** (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 andinformal) - asking for and giving information/directions. Functional English: Permissions, Requesting, Inviting.

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

Reading for Writing: Information transfer; describe, compare, contrast, identify significance/trendsbased on information provided in figures/charts/graphs/tables. Writing SOP, writing for media.

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

Grammar: Quantifying expressions - adjectives and adverbs; comparing and contrasting; degrees ofcomparison; 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 inspeaking 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 Strategy Intensive reading and Extensive readingtechniques.

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

Vocabulary: Technical vocabulary from across technical branches (20 words) GRE Vocabulary (20words) (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:

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

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

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.

		L	T	P	C
I Year - I Semester		**3**	**0**	**0**	**3**
ENGINEERING CHEMISTRY (BS1102)					

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.

Learning Objectives:

Importance of usage of plastics in household appliances and composites (FRP) in aerospaceand 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 increase in demand as wide variety of advanced materials are introduced; whichhave excellent engineering properties.

Classifyand discuss the materials used in major industries like steel industry, metallurgicalindustries 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 likethermal 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 drinkingpurposes.

UNIT I:
POLYMER TECHNOLOGY

Polymerisation:-Introduction-methods of polymerization (emulsion and suspension)-physical andmechanical properties.
Plastics: Compounding-fabrication (compression, injection, blown film, extrusion) - preparation,properties and applications of PVC, polycarbonates and Bakelite-mention some examples of plastic materials used in electronic gadgets, recycling of e-plastic waste.
Elastomers:- Natural rubber-drawbacks-vulcanization-preparation, properties and applications ofsynthetic rubbers (Buna S, thiokol and polyurethanes).
Composite materials: Fiber reinforced plastics-conducting polymers-biodegradable polymers-biopolymers-biomedical polymers.

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

Outline the properties of polymers and various additives added and different methods offorming plastic materials.
Explain the preparation, properties and applications of some plastic materials.
Interpret the mechanism of conduction in conducting polymers .
Discuss natural and synthetic rubbers and their applications.

UNIT II:
ELECTROCHEMICAL CELLS AND CORROSION

Single electrode potential-Electrochemical series and uses of series-standard hydrogen electrode, calomel electrode-concentration cell-construction of glass electrode-Batteries: Dry cell, Ni-Cd cells, Ni-Metal hydride cells, Li ion battery, zinc air cells–Fuel cells: H2-O2, CH3OH-O2, phosphoric acid, molten carbonate.

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

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

Explain the theory of construction of battery and fuel cells.
Categorize the reasons for corrosion and study some methods of corrosion control.

UNIT III:
CHEMISTRY OF MATERIALS

Part- A:

Nano materials:- Introduction-sol-gel method-characterization by BET, SEM and TEM methods-applications of graphene-carbon nanotubes and fullerenes: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 and properties (definition and importance).

Cement: - Constituents, manufacturing, parameters to characterize the clinker formation: limesaturation factor (LSF), silica ratio (SR) and alumina ratio (AR), chemistry of setting and hardening, deterioration of cement.

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

Outline the awareness of materials like nanomaterials and fullerenes and their uses.
Explain the techniques that detect and measure changes of state of reaction.
Illustrate the commonly used industrial materials.

UNIT IV:
FUELS

Introduction-calorific value-HCV and LCV-problems using Dulong's formula-proximate and ultimate analysis of coal sample-significance of these analyses-problems-Petroleum (refining-cracking)-Synthetic petrol (Fischer Tropsch and Bergius)-petrol knocking-diesel knocking-octane and cetane ratings-anti-knock agents-Introduction to alternative fuels (Bio-diesel, ethanol, methanol, Natural gas, LPG, CNG)-Flue gas analysis by Orsat apparatus-Rocket fuels.

Learning 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.
Analyse flue gases.

UNIT V:
WATER TECHNOLOGY

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 processs and related sums, ion exchange process)-treatment of industrial waste water

Portable water and its specifications-steps involved in purification of water-chlorination, break point chlorination-reverse osmosis and electro dialysis.

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

Explain the impurities present in raw water, problems associated with them and how to avoidthem are understood.

Standard Books:

Engineering Chemistry by Jain and Jain; Dhanpat Rai Publicating Co. Latest edition
Engineering Chemistry by Shikha Agarwal; Cambridge University Press, 2019 edition.
A text book of engineering Chemistry by S. S. Dara; S. Chand & Co Ltd., Latest Edition
Engineering Chemistry by Shashi Chawla; Dhanpat Rai Publicating Co. Latest edition

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I Year I Sem	**ESSENTIALS OF ELECTRICAL AND ELECTRONICS ENGINEERING (Common for Civil Engg. & CSE)(ES1101)**	**L** **3**	**T** **0**	**P** **0**	**C** 3

Preamble:

This course covers the topics related to analysis of various electrical circuits, operation of various electrical machines and electronic components to perform well in their respective fields.

Course objectives:

- To learn the basic principles of electrical circuital law's and analysis of networks.
- To understand principle of operation and construction details of DC machines & Transformers.
- To understand principle of operation and construction details of alternator and 3-Phase induction motor.
- To study operation of PN junction diode, half wave, full wave rectifiers and OP-AMPs.
- To learn operation of PNP and NPN transistors and various amplifiers.

Unit - I

Electrical Circuits

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

Unit - II

DC Machines

Principle of operation of DC generator – EMF equation – types of DC machines – torque equation – applications – three point starter – speed control methods of DC motor – Swinburne's Test-Numerical Problems.

Unit - III

AC Machines:

Transformers

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

AC Rotating Machines

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

Unit IV

Rectifiers and Linear ICs and Transistors

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

Unit V

Transistors

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

Course Outcomes:

The student should be able to:

- Analyse various electrical networks.
- Understand operation of DC generators,3-point starter and DC machine testing by Swinburne's Test.
- Analyse performance of single-phase transformer.
- Explain operation of 3-phase alternator and 3-phase induction motors.
- Analyse operation of half wave, full wave bridge rectifiers and OP-AMPs and Explain single stage CE amplifier and concept of feedback amplifier.

Text Books:

1. Electrical Technology by Surinder Pal Bali, Pearson Publications.
2. Electronic Devices and Circuits by R.L. Boylestad and Louis Nashelsky, 9th edition, PEI/PHI 2006.

Reference Books:

1. Electrical Circuit Theory and Technology by John Bird, Routledge Taylor &Francis Group
2. Basic Electrical Engineering by M.S.Naidu and S.Kamakshiah, TMH Publications
3. Fundamentals of Electrical Engineering by Rajendra Prasad, PHI Publications,2nd edition
4. Basic Electrical Engineering by Nagsarkar, Sukhija, Oxford Publications,2nd edition
5. Industrial Electronics by G.K. Mittal, PHI.

		L	T	P	C
I Year - I Semester		**1**	**0**	**3**	**2.5**

ENGINEERING DRAWING (ES1103)

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 polygonson 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 pointsin 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 tobooththe 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 ofsolids 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. Thestudent 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.

TEXTBOOKS:

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

REFERENCE BOOKS:

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

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

I Year - I Semester		L	T	P	C
		0	0	3	1.5
ENGLISH COMMUNICATION SKILLS LAB (HS1102)					

UNIT I:

Vowels, Consonants, Pronunciation, Phonetic Transcription

UNIT II:

Past tense markers, word stress-di-syllabic words, Poly-Syllabic words

UNIT III:

Rhythm & Intonation

UNIT IV:

Contrastive Stress (Homographs)

UNIT V:

Word Stress: Weak and Strong forms
Stress in compound words

References books:

Infotech English, Maruthi Publications (with Compact Disc).
Exercises in Spoken English Part 1,2,3,4, OUP and CIEFL.
English Pronunciation in use- Mark Hancock, Cambridge University Press.
English Phonetics and Phonology-Peter Roach, Cambridge University Press.
English Pronunciation in use- Mark Hewings, Cambridge University Press.
English Pronunciation Dictionary- Daniel Jones, Cambridge University Press.
English Phonetics for Indian Students- P. Bala Subramanian, Mac Millan Publications.

		L	T	P	C
I Year - II Semester		**0**	**0**	**3**	**1.5**

ENGINEERING CHEMISTRY LAB (BS1103)

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

Determination of HCl using standard Na2CO3 solution.
Determination of alkalinity of a sample containing Na2CO3 and NaOH.
Determination of Mn (II) using standard oxalic acid solution.
Determination of ferrous iron using standard K2Cr2O7 solution.
Determination of copper (II) using standard hypo solution.
Determination of temporary and permanent hardness of water using standard EDTA solution.
Determination of iron (III) by a colorimetric method.
Determination of the concentration of acetic acid using sodium hydroxide (pH-metry method).
Determination of the concentration of strong acid vs strong base (by conductometric method).
Determination of strong acid vs strong base (by potentiometric method).
Determination of Mg^{+2} presentin an antacid.
Determination of CaCO3 present in an egg shell.
Estimation of Vitamin C.
Determination of phosphoric content in soft drinks.
Adsorption of acetic acid by charcoal.
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 tolab 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.

I Year - II Semester	**WORKSHOP PRACTICE LAB (ES1104)**	**L**	**T**	**P**	**C**
		0	**0**	**3**	**1.5**

Course Objective: To impart hands-on practice on basic engineering trades and skills.
Note: At least two exercises to be done from each trade.
Trade:

1.Carpentry
1. T-Lap Joint
Cross Lap Joint
Dovetail Joint
Mortise and Tenon Joint

Square Fit
Half Round Fit
Dovetail Fit

2.Black Smithy
1. Round rod to Square
S-Hook
Round Rod to Flat Ring
Round Rod to Square headed bolt

3.House Wiring
1. Parallel / Series Connection of three bulbs
Stair Case wiring
Florescent Lamp Fitting
Measurement of Earth Resistance

Square Box without lid
Open Scoop
Funnel

4.IT Workshop
1.Assembly & Disassembly of Computer

Essentials of Electrical and Electronics Engineering Lab

		L	T	P	C
I Year - II Semester		**3**	**0**	**0**	**0**

ENVIRONMENTAL SCIENCE (MC1101)

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.

UNIT – IV:

Environmental Pollution: Definition, Cause, effects and control measures of Airpollution, 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 wellbeing.

Solid Waste Management: Sources, Classification, effects and control measures of urban andindustrial solid wastes. Consumerism and waste products, Biomedical, Hazardous and e – waste management.

UNIT – V:

Social Issues and the Environment: Urban problems related to energy -Waterconservation, 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. Udaya Bhaskar, Cengage leraning.
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

		L	T	P	C
I Year - II Semester		**3**	**0**	**0**	**3**

MATHEMATICS - II (BS1201)
(Common to all Branch's for I Year B. Tech)

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 approximating the 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 different algorithms for approximating the solutions of ordinary differential equations 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 equations linear equations – Gauss Elimination for solving system of equations – Eigen values and Eigen vectors and their properties.

Unit-II: Cayley-Hamilton theorem and Quadratic forms: (10 hrs)

Cayley-Hamilton theorem (without proof) – Finding 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 (Ref.

Book – 1).

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.

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 integration and solution of ordinary differential equations: (10 hrs)

Trapezoidal rule – Simpson's $1/3^{rd}$ and $3/8^{th}$ rule– Solution of ordinary differential equations 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, 43^{rd}Edition, Khanna Publishers.
2. **B. V. Ramana,** Higher Engineering Mathematics, 2007 Edition, Tata Mc. Graw HillEducation.

Reference Books:

1. **David Poole,** Linear Algebra- A modern introduction, 4^{th}Edition, Cengage.
2. **Steven C. Chapra,** Applied Numerical Methods with MATLAB for Engineering andScience,Tata Mc. Graw Hill Education.
3. **M. K. Jain, S. R. K. Iyengar and R. K. Jain,** Numerical Methods for Scientific andEngineering Computation, New Age International Publications.
4. **Lawrence Turyn,** Advanced Engineering Mathematics, CRC Press.

		L	T	P	C
I Year - II Semester		**3**	**0**	**0**	**3**
MATHEMATICS-III (BS1202) (Common to ALL Branch's of I 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 Objectives: 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).

UNIT II:Laplace Transforms: (10 hrs)

Laplace transforms of standard functions — Shifting theorems — Transforms of derivatives and integrals —Unit step function — Dirac's delta 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 — inverse transforms — Finite Fourier transforms.

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

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 — RHS 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, 43rdEdition, Khanna Publishers.
2. **B. V. Ramana**, Higher Engineering Mathematics, 2007 Edition, Tata Mc. Graw HillEducation.

Reference Books:

1. **Erwin Kreyszig**, Advanced Engineering Mathematics, 10thEdition, Wiley-India.
2. **Dean. G. Duffy**, Advanced Engineering Mathematics with MATLAB, 3rdEdition, CRCPress.
3. **Peter O' Neil**, Advanced Engineering Mathematics, Cengage.
4. **Srimantha Pal, S C Bhunia,** Engineering Mathematics, Oxford University Press.

		L	T	P	C
I Year - II Semester		**3**	**0**	**0**	**3**
ENGINEERING PHYSICS (BS1203)					

Course Objectives:

Physics curriculum which is re-oriented to the needs of non-circuital branches of graduate engineering courses offered by JNT University Kakinada that serves as a transit to understand the branch specific advanced topics. The course is designed to:

Impart concepts of mechanics required to identify forces and moments in mechanical systems by vector representation-extend Newton's second law for inertial and non-inertial frames of reference- study different types of harmonic oscillatory motions.

Tap the Simple harmonic motion and its adaptability for improved acoustic quality of concert halls- impart concepts of flaw detection techniques using ultrasonics.

Study the structure- property relationship exhibited by solid materials within the elastic limit.

Impart knowledge in basic concepts of LASERs along with its Engineering applications-
Familiarize types of sensors for various engineering applications
Explore the knowledge of magnetic and dielectric materials and their utility in appliances.

UNIT-I (**10hrs)**

MECHANICS: Basic laws of vectors and scalars, rotational frames-conservative and non–conservative forces, F = - grad V, Newton's laws in inertial and linear accelerating non-inertial frames of reference, rotating frame of reference with constant angular velocity, Harmonic oscillator ; damped harmonic motion ; Forced oscillations and resonance.

Outcome:

The students will be able to

Identify forces and moments in mechanical systems using scalar and vector techniques.
Extend Newton's second law for inertial and non-inertial frame of reference.
Explain simple harmonic motion and damped harmonic motions.

UNIT-II (**10hrs)**

ACOUSTICS & ULTRASONICS: Introduction – Reverberation - Reverberation time - Sabine'sformula (Derivation using growth and decay method)–absorption coefficient and its determination-factors affecting acoustics of buildings and their remedies.

Production of ultrasonics by Magnetostriction and piezoelectric methods – Detection of ultrasonics - acoustic grating - Non-Destructive Testing- pulse echo system through transmission and reflection modes - Applications.

UNIT-III (**9hrs)**

ELASTICITY: stress,strain, Hooke's law, stress-strain curve, generalized Hooke's law with andwithout thermal strains for isotropic materials, different types of moduli and their relations, bending of beams – Bending moment of a beam – Depression of cantilever.

Outcome:

The students will be able to

Understand the elasticity and plasticity concepts.
Study different types of moduli and their relation
Analyze the concepts of shearing force and moment of inertia.

UNIT-IV (**9hrs)**

LASERS & SENSORS: Characteristics–Spontaneous and Stimulated emission of radiation–population inversion - Einstein's coefficients & Relation between them and their significance - Pumping Mechanisms - Ruby laser – Helium Neon laser – Applications.

SENSORS (qualitative description only): Different types of sensors and applications; Strain andPressure sensors- Piezoelectric, magneto strictive sensors, Temperature sensor - bimetallic strip, pyroelectric detectors.

Outcome:

The students will be able to

Understandthe basic concepts of LASER light Sources.
Study Different types of laser systems
Identify different types of sensors and their working principles.

UNIT-V (**10hrs)**

MAGNETISM & DIELECTRICS: Introduction **– Magnetic** dipolemoment–Magnetization-Magnetic susceptibility and permeability – Origin of permanent magnetic moment – Bohr Magneton - Classification of magnetic materials (Día, Para and Ferro) – Domain concept of Ferromagnetism - Hysteresis – soft and hard magnetic materials – Applications of Ferromagnetic materials.

Introduction - Dielectric polarization **–** Dielectric polarizability, Susceptibility and Dielectric constant-types of polarizations: Electronic and Ionic (Quantitative), Orientational polarizations (qualitative)-Lorentz internal field – Claussius_Mossoti equation- Frequency dependence of polarization - Applications of dielectrics.

Outcome:

The students will be able to

Explainthe concept of dielectric constant and polarization in dielectric materials.
Summarizevarious types of polarization of dielectrics.
Interpre**t** Lorentz field and ClaussiusMosotti relation in dielectrics.
Classifythe magnetic materials based on susceptibility and their temperature dependence.
Explainthe applications of dielectric and magnetic materials.
Applythe concept of magnetism to magnetic devices.

Text Books:

1. "Engineering Mechanics" by Manoj K Harbola, Cengage Publications 2nd Eds.
2. "A text book of Engineering Physics" by P G Kshirsagar & M NAvadhanulu, S Chand & Company Ltd.
3. "Engineering Physics" by R K Gaur and S L Gupta, Dhanpat RaiPublications.
4. "Sensor and Transducers" by Ian R Sinclair, Elsevier (Newnes) 3rd Eds.

Reference Books:

1. "Engineering Physics" by M R Srinivasan, New Age InternationalPublishers.
2. "Lectures on Physics" by Richard P Feynman, Pearson Publishers, NewMillennium Eds.
3. "Lasers and Non-linear Optics" by B B Laud, New Age International Publishers (3rd Eds.).

		L	T	P	C
I Year - II Semester		**3**	**0**	**0**	**3**

PROBLEM SOLVING & PROGRAMMING USING C (ES1201)

COURSE OBJECTIVES:

The objectives of Programming for Problem Solving Using C are

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

COURSE OUTCOMES:

Upon the completion of the course the student will learn

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

UNIT I

Introduction to Computers: Creating and running Programs, Computer Numbering System, StoringIntegers, 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, EvaluatingExpressions, 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, MultiwaySelection, More Standard Functions

Repetition: Concept of Loop, Pretest and Post-test Loops, Initialization and Updating, Event andCounter 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,MultidimensionalArrays, Programming Example – Calculate Averages

Strings: String Concepts, C String, String Input / Output Functions, Arrays of Strings, StringManipulation 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 AllocationFunction, Array of Pointers, Programming Application **Processor Commands**: Processor Commands

UNIT V

Functions: Designing, Structured Programs, Function in C, User Defined Functions, Inter-FunctionCommunication, 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:

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

REFERENCES:

Computer Fundamentals and Programming, Sumithabha Das, Mc Graw Hill
Programming in C, Ashok N. Kamthane, Amit Kamthane, Pearson
Computer Fundamentals and Programming in C, Pradip Dey, Manas Ghosh, OXFORD

		L	T	P	C
I Year - II Semester		**3**	**1**	**0**	**4**

ENIGINEERING MECHANICS (ES1202)

Objectives: The students completing this course are expected to understand the concepts of forcesand 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 center 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 center 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 ofForce and its Application – Couples and Resultant of Force Systems.

Equilibrium of Systems of Forces: Free Body Diagrams, Equations of Equilibrium ofCoplanar Systems, and Spatial Systems for concurrent forces. LamisTheorem, 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 – II

Centroid: Centroids of simple figures (from basic principles)–Centroids ofComposite Figures**Centre of Gravity:**Centre of gravity of simple body (from basic principles), Centre of gravity ofcomposite bodies, Pappus theorem.

Area moments of Inertia: Definition–Polar Moment of Inertia, Transfer Theorem, Moments ofInertia 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 ofInertia, mass moment of inertia of composite bodies

UNIT – III

FRICTION Types of friction – Limiting friction and impending motion – Laws of Friction – Static and Dynamic Friction – Angle of Friction –Coulomb's laws of dry friction, Coefficient of friction - Cone of limiting friction– Friction of wedge, block and Ladder

UNIT IV

Kinematics: Rectilinear and Curvilinear motions–Velocity and Acceleration–Motion of RigidBody – Types and their Analysis in Planar Motion.

Introduction – Rectilinear motion – Motion with uniform andvariableacceleration– Curvilinearmotion–Componentsofmotion– Circular motion – Projectiles- Instantaneous center.

UNIT – V

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:

Engineering Mechanics - S.Timoshenko& D.H.Young., 4thEdn, Mc Graw Hill publications.
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 Pyteland JaanKiusalaas, Cengage Learning publishers.
3. Engineering Mechanics, dynamics, Bhavikatti S.S – NewAgeInternational Publishers.
4. Engineering Mechanics, statics and dynamics – I.H. Shames, – Pearson Publications
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 Mc Graw Hill Publ.
7. Theory & Problems of engineering mechanics, statics & dynamics –Engineering Mechanics, Fedinand. L. Singer, Harper – Collins.
8. Engineering Mechanics statics and dynamics, A Nelson, Mc Graw Hill publications
9. Engineering Mechanics, Tayal. Umesh Publications.

		L	T	P	C
I Year - II Semester		**0**	**0**	**3**	**1.5**

ENGINEERING PHYSICS LAB (BS1204)

(Any 10 of the following listed 15 experiments)

LIST OF EXPERIMENTS:

a. Determination of Rigidity modulus of a material- Torsional Pendulum.
b. Determination of Young's modulus by method of single cantilever oscillations.
c. Determination of Acceleration due to Gravity and Radius of Gyration - Compound Pendulum.
d. Verification of laws of vibrations in stretched strings – Sonometer.
e. Determination of spring constant of springs using coupled oscillators.
f. Magnetic field along the axis of a current carrying coil – Stewart and Gee's apparatus
g. Study the variation of B versus H by magnetizing the magnetic material (B-H curve).
h. Measurement of magnetic susceptibility by Gouy's method.
i. Determination of ultrasonic velocity in liquid (Acoustic Grating)
j. Determination of dielectric constant by charging and discharging method
k. Determination of wavelength of Laser by diffraction grating
l. Determination of particle size using Laser.
m. Determeination of Pressure variation using strain Gauge sensor.
n. Determination of Moment of Inertia of a Fly Wheel.
o. Determination of Velocity of sound –Volume Resoantor.

English Communication Skills Lab - II

Physics Virtual Lab

		L	T	P	C
I Year - II Semester		**0**	**0**	**3**	**1.5**

PROBLEM SOLVING & PROGRAMMING USING C LAB (ES1203)

Course Objectives:

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

Exercise 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.
Write a C program to compute the perimeter and area of a rectangle with a height of 7 inches and width of 5 inches.
Write a C program to display multiple variables.

Exercise 2:

Write a C program to calculate the distance between the two points.
Write a C program that accepts 4integers 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:

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

Exercise 4:

Write a program in C to display the n terms of even natural number and their sum.
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.
Write a C program to check whether a given number is an Armstrong number or not.

Exercise 5:

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

Exercise 6:

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

Exercise 7:

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

Exercise 8:

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

Exercise 9:

Write a C Program to Store Information Using Structures with Dynamically Memory Allocation

Write a program in C to demonstrate how to handle the pointers in the program.

Exercise 10:

Write a program in C to demonstrate the use of & (address of) and *(value at address) operator.

Write a program in C to add two numbers using pointers.

Exercise 11:

Write a program in C to add numbers using call by reference.

Write a program in C to find the largest element using Dynamic Memory Allocation.

Exercise 12:

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

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

Exercise 13:

Write a program in C to show how a function returning pointer.

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:

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

Write a program in C to convert decimal number to binary number using the function.

Exercise 15:

Write a program in C to check whether a number is a prime number or not using the function.

Write a program in C to get the largest element of an array using the function.

Exercise 16:

Write a program in C to append multiple lines at the end of a text file.

Write a program in C to copy a file in another name.

Write a program in C to remove a file from the disk.

Course Outcomes:

By the end of the Lab, the student

Gains Knowledge on various concepts of a C language.

Able to draw flowcharts and write algorithms.

Able design and development of C problem solving skills.

Able to design and develop modular programming skills.

Able to trace and debug a program

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

ENGINEERING EXPLORATION PROJECT (PR1201)

COURSE OBJECTIVES:

Build mindsets & foundations essential for designers

Learn about the Human-Centered Design methodology and understand their real-world applications

Use Design Thinking for problem solving methodology for investigating illdefined problems.

Undergo several design challenges and work towards the final design challenge

Apply Design Thinking on the following Streams to

Project Stream 1: Electronics, Robotics, IOT and Sensors

Project Stream 2: Computer Science and IT Applications

Project Stream 3: Mechanical and Electrical tools

Project Stream4: Eco-friendly solutions for waste management, infrastructure, safety, alternative energy sources, Agriculture, Environmental science and other fields of engineering.

HOW TO PURSUE THE PROJECT WORK?

The first part will be learning-based-masking students to embrace the methodology by exploring all the phases of design thinking through the wallet/ bag challenge and podcasts.

The second part will be more discussion-based and will focus on building some necessary skills as designers and learning about complementary material for human- centered design.

The class will then divide into teams and they will be working with one another for about 2 – 3 weeks. These teams and design challenges will be the basis for the final project and final presentation to be presented.

The teams start with **Design Challenge** and go through all the phases more in depth from coming up with the right question to empathizing to ideating to prototyping and to testing.

Outside of class, students will also be gathering the requirements, identifying the challenges, usability, importance etc

At the end, Students are required to submit the final reports, and will be evaluated by the faculty.

TASKS TO BE DONE:

Task 1: Everyone is a Designer

Understand class objectives & harness the designer mindset

Task 2: The Wallet/Bag Challenge and Podcast

Gain a quick introduction to the design thinking methodology

Go through all stages of the methodology through a simple design challenge

Podcast: Observe, Listen and Engage with the surrounding environment and identify a design challenge.

Task 3: Teams & Problems

Start Design Challenge and learn about teams & problems through this, Foster team collaboration, find inspiration from the environment and learn how to identify problems

Task 4: Empathizing

Continue Design Challenge and learn empathy

Learn techniques on how to empathize with users

Go to the field and interview people in their environments

Submit Activity Card

Task 5: Ideating

Continue Design Challenge and learn how to brainstorm effectively
Encourage exploration and foster spaces for brainstorming
Submit Activity Card

Task 6: Prototyping

Continue Design Challenge and learn how to create effective prototypes
Build tangible models and use them as communication tools
Start giving constructive feedback to classmates and teammates
Submit Activity Card

Task 7: Testing

Finish Design Challenge and iterate prototypes and ideas through user feedback
Evolve ideas and prototypes through user feedback and constructive criticism
Get peer feedback on individual and group performance
Submit Activity Card

Task 8:

Final Report Submission and Presentation

Note: The colleges may arrange for Guest Speakers from Various Design Fields: Graphic Design,Industrial Design, Architecture, Product Design, Organizational Design, etc to enrich the students with Design Thinking Concept.

REFERENCES:

Tom Kelly, *The Art of Innovation: Lessons in Creativity From IDEO, America's Leading Design Firm* (Profile Books, 2002)

Tim Brown, Change by Design: How Design Thinking Transforms Organizations and Inspires Innovation (HarperBusiness, 2009)

Jeanne Liedtka, Randy Salzman, and Daisy Azer, Design Thinking for the Greater Good: Innovation in the Social Sector (Columbia Business School Publishing, 2017)

OTHER USEFUL DESIGN THINKING FRAMEWORKS AND METHODOLOGIES:

Human-Centered Design Toolkit (IDEO); https://www.ideo.com/post/design-kit
Design Thinking Boot Camp Bootleg (Stanford D-School);
https://dschool.stanford.edu/resources/the-bootcamp-bootleg
Collective Action Toolkit (frogdesign);
https://www.frogdesign.com/wpcontent/uploads/2016/03/CAT_2.0_English.pdf
Design Thinking for Educators (IDEO); https://designthinkingforeducators.com/

II Year - I Semester		**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**
Complex Variables and Statistical Methods /PROBABILITY AND STATISTICS (BS2101)					

Course Objectives:

- To familiarize the complexvariables.
- To familiarize the students with the foundations of probability and statisticalmethods.
- To equip the students to solve application problems in theirdisciplines.

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:

Introduction – Continuity – Differentiability – Analyticity – Properties – Cauchy-Riemann equations in Cartesian and polar coordinates – Harmonic and conjugate harmonic functions – Milne – Thompson method.

Complex integration: Line integral – Cauchy's integral theorem – Cauchy's integral formula – Generalized integral formula (all without proofs).

UNIT – II: Series expansions and Residue Theorem:

Radius of convergence – Expansion in Taylor's series, Maclaurin's series and Laurent series.
Types of Singularities: Isolated – pole of order m – Essential – Residues – Residue theorem

(without proof)– Evaluationof real integralof thetype $\int_{-\infty}^{\infty} f(x)dx$

UNIT – III: Probability and Distributions:

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

UNIT – IV: Sampling Theory:

Introduction – Population and samples – Sampling distribution of Means and Variance (definition only) – Central limit theorem (without proof) – Introduction to t, □ ^{2}and F-distributions – Point and Interval estimations – Maximum error of estimate.

UNIT – V: Tests of Hypothesis:

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, 43rd Edition, KhannaPublishers.
2. **Miller and Freund's,** Probability and Statistics for Engineers, 7/e, Pearson,2008.

Reference Books:

1. **S. C. Gupta and V. K. Kapoor**, Fundamentals of Mathematical Statistics, 11/e, Sultan Chand & Sons Publications,2012.
2. **Jay l. Devore,** Probability and Statistics for Engineering and the Sciences, 8th Edition, Cengage.
3. **Shron L. Myers, Keying Ye, Ronald E Walpole,** Probability and Statistics Engineers and the Scientists, 8th Edition, Pearson 2007.
4. **Sheldon, M. Ross**, Introduction to probability and statistics Engineers and the Scientists, 4th Edition, Academic Foundation,2011

II Year - I Semester

L	T	P	C
3	0	0	3

STRENGTH OF MATERIALS (PC2101)

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 crosssections

The concepts above will be utilized in measuring deflections in beams under various loading and supportconditions

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 underthe influence of different external loading conditions and the supportconditions

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

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 loadingconditions

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'sequation.

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

UNIT – III: Flexural and shear Stresses in beams

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

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

UNIT – IV: Deflection of Beams: Bending into a circular arc–slope, deflection and radius ofcurvature – 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:

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

Strength of materials by R. K. Bansal, LakshmiPublications.

REFERENCES:

Mechanics of Materials- by R. C.Hibbler, Pearson publishers

Mechanics of Solids – E P Popov, Prentice Hall.

Strength of Materials by B.S.Basavarajaiah and P. Mahadevappa, 3rd Edition,Universities Press

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

		L	T	P	C
II Year - I Semester		**3**	**0**	**0**	**3**
FLUID MECHANICS (PC2102)					

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 analyze 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 analyse 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 curvedsurfaces – 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 astream line - Momentum equation and its application – forces on pipe bend.

UNIT – III

Laminar Flow and Turbulent Flows: Reynold's experiment –Characteristics of Laminar &Turbulent flows, Shear and velocity distributions, Laws of Fluid friction, Hagen-Poiseulle Formula, Flow between parallel plates, Flow through long tubes, hydrodynamically 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, smallorifice 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 ofboundary 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:

Modi P.N and Seth S.M.(2018), "Fluid mechanics", Standard book house, New Delhi
AtextofFluidmechanicsandhydraulicmachines,R.K.Bansal-LaxmiPublications (P) ltd., New Delhi

References:

K.Subramanyam, Fluid mechanics and hydraulic machines Mc graw hill education, IInd 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.

II Year - I Semester		**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**
SURVEYING AND GEOMATICS (ES2101)					

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 andangles
- Recording of observationaccurately
- Perform calculations based on theobservation
- Identification of source of errors and rectificationmethods
- Apply surveying principles to determine areas and volumes and setting outcurves
- Use modern surveying equipment's for accurateresults

Course Outcomes: Course will enable the student to:

- Apply the knowledge to calculate angles, distances andlevels
- Identify data collection methods and prepare fieldnotes
- 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 andmethodologies

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 locatingbearings.

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, Trigonometrical levelling 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.
Tacheometric Surveying: Principles of Tacheometry, stadia and tangential methods of Tacheometry,

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., NewDelhi.
2. Chandra A M, "Plane Surveying and Higher Surveying", New age International Pvt. Ltd., Publishers, NewDelhi.
3. Duggal S K, "Surveying (Vol – 1 & 2), Tata McGraw Hill Publishing Co. Ltd. NewDelhi.

REFERENCES:

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

II Year - I Semester - B. Tech - Civil Engineering

L	T	P	C
4	0	0	3

ENGINEERING GEOLOGY(ES2102)

Course LearningObjectives:

The objective of this courseis:

- 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.

SYLLABUS:

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, Sandstone, Limestone, Laterite, Quartzite, Gneiss, Schist, Marble, Khondalite and Slate.

UNIT-III

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

UNIT-IV

Ground Water: Water table, Cone of depression, Geological controls of Ground Water Movement, Ground Water Exploration Techniques.

Earthquakes and Land Slides: Terminology, Classification, causes and effects, Shield areas and Seismic bells, Richter scale intensity, Precautions of building constructions in seismic areas. Classification of Landslides Causes and Effects, measures to be taken prevent their occurrence at Landslides.

Geophysics: Importance of Geophysical methods, Classification, Principles of Geophysical study by Gravity method, Magnetic method, Electrical methods, Seismic methods, Radiometric method and Electrical resistivity, Seismic refraction methods and Engineering properties of rocks.

UNIT-V

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

TEXTBOOKS:

1. 'Engineering Geology' by Subinoy Gangopadhay, Oxford University Press, (2012).
2. 'Engineering Geology' by D. Venkat Reddy, Vikas Publishing House Pvt. Ltd, (2013).
3. 'Engineering Geology, 2nd Edition' by N. Chenn kesavulu, Trinity Press - Laxmi Publications, (2014).
4. 'Engineering Geology' by Vasudev Kanithi, Universities Press, (2013).

REFERENCES:

1. 'Engineering Geology for Civil Engineers' by P.C. Varghese, PHI learning pvt. Ltd, (2012).
2. 'Geology for Engineers and Environmental Society, 3rd Edition' by Alan E Kehew, Pearson publications, (2013).
3. 'Fundamentals of Engineering Geology' by P.G.Bell, B.S.P. Publications, (2012).
4. 'Engineering Geology' by A.Parthesarathi et al., Wiley Publications (2013).
5. 'Environmental Geology, 2rd Edition' by K.S.Valdiya, McGraw Hill Publications, (2013).

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II Year - I Semester		**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**
BUILDING METERIALS AND CONSTRUCTION(PC2103)					

I. Objectives of theCourse:

- Initiating the student with the knowledge of basic building materials and theirproperties.
- Imparting the knowledge of course pattern in masonry construction and flat roofs and techniques of forming foundation, columns, beams, walls, sloped andflatroofs.
- The student is to be exposed to the various patterns of floors, walls, different types of paintsandvarnishes.
- Imparting the students with the techniques of formworkandscaffolding.
- The students should be exposed to classification of aggregates, moisture content of theaggregate.

II. CourseOutcomes:

Upon the successful completion of the course:

- The student should be able to identify different building materials and their importance in buildingconstruction.
- The student is expected to differentiate brick masonry, stone masonry constructionand use of lime and cement invariousconstructions.
- The student should have learnt the importance of building components andfinishings.
- The student is expected to know the classification of aggregates, sieve analysis and moisture content usually required inbuildingconstruction.

UNIT I: Stones, Bricks and Tiles:

Properties of building stones – relation to their structural requirements, classification of stones – stone quarrying – precautions in blasting, dressing of stone, composition of good brick earth, various methods of manufacturing of bricks. Characteristics of good tile - manufacturing methods, types of tiles. Uses of materials like Aluminium, Gypsum, Glass and Bituminousmaterials

UNIT II Masonry:

Types of masonry, English and Flemish bonds, Rubble and Ashlar Masonry. Cavity and partition walls. Wood: Structure – Properties- Seasoning of timber- Classification of various types of woods used in buildings- Defects in timber. Alternative materials for wood – Galvanized Iron, Fiber Reinforced Plastics, Steel, Aluminium.

UNIT III: Lime and Cement: Lime: Various ingredients of lime – Constituents of lime stone – classification of lime – various methods of manufacture of lime.

Cement: Portland cement- Chemical Composition – Hydration, setting and fineness of cement. Various types of cement and their properties. Various field and laboratory tests for Cement. Various ingredients of cement concrete and their importance – various tests for concrete.

UNIT IV: Building Components:

Lintels, arches, vaults, stair cases – types. Different types of floors – Concrete, Mosaic, Terrazzo floors, Pitched, flat roofs. Lean to roof, Coupled Roofs. Trussed roofs – King and Queen post Trusses. R.C.C Roofs, Madras Terrace and Pre fabricated roofs.

UNITV: Finishings and Aggregates:

Damp Proofing and water proofing materials and uses – Plastering Pointing, white washing and distempering. Paints: Constituents of a paint

– Types of paints – Painting of new/old wood- Varnish. Form Works andScaffoldings.
Aggregates - Classification of aggregate – Coarse and fine aggregates- particle shape and texture – Bond and Strength of aggregate – Specific gravity – Bulk Density, porosity and absorption – Moisture content of Aggregate- Bulking of sand – Sieve analysis.

Text Books:

1. Building Materials, S. S. Bhavikatti, Vices publications Houseprivateltd.
2. Building Construction, S. S. Bhavikatti, Vices publications Houseprivateltd.
3. Building Materials, B. C. Punmia, Laxmi Publications privateltd.
4. Building Construction, B.C. Punmia, Laxmi Publications(p)ltd.

References:

1. Building Materials, S. K. Duggal, New Age InternationalPublications.
2. Building Materials, P. C. Verghese, PHI learning(P)ltd.
3. Building Materials, M. L. Gambhir, Tata McGraw Hill Publishing Co. Ltd. NewDelhi.
4. Building construction, P. C. Verghese, PHI Learning(P)Ltd.
5. Building Materials, Construction andPlanning,S.Mahaboob Basha, Anuradha Publications,Chennai.

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II Year - I Semester

L	**T**	**P**	**C**
0	**0**	**3**	**1.5**

STRENGTH OF MATERIALS LAB(PC2104)

Experiments

Tension test on Mild steelbar
Bending test on (Steel / Wood) Cantileverbeam.
Bending test on simply supportedbeam.
Torsiontest
Hardnesstest
Spring test
Compression test on wood orconcrete
Impacttest (Charpy and Izod impact test)
Sheartest (on UTM)
Verification of Maxwell's Reciprocal theorem onbeams.
Use of Electrical resistance straingauges
Continuous beam – deflection test.

List of Major Equipment:

Universal Testing Machine
Torsion testingmachine
Brinnell's / Rock well's hardness testingmachine
Setup for springtests
Compression testingmachine
Izod Impactmachine
Shear testingmachine
Beam setup for Maxwell's theoremverification.
Electrical Resistance gauges

II Year - I Semester		**L**	**T**	**P**	**C**
		0	**0**	**3**	**1.5**
SURVEYING FILED WORK – I(PC2105)					

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(Closedcircuit)
3. Determination of distance between two inaccessible points byusing 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 methodof Radiation
6. Plane table survey; finding the area of a given boundary by the method of intersection.
7. Two Point Problem by the planetable survey.
8. Fly levelling : Height of the instrument method (differential levelling)
9. Fly levelling: rise andfall 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 fieldwork).

Note: Any 10 field work assignments must be completed.

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II Year - II Semester - B.Tech - Civil Engineering	**L**	**T**	**P**	**C**
	0	**0**	**2**	**1**

ENGINEERING GEOLOGY LAB(ES2103)

Course LearningObjectives:

The objective of this courseis:

- 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 – Sandstone, Ferrugineous sand stone, Lime stone, Shale, Laterite, Conglomerate, 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.

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.

* * *

IIYear –IISem

L+T	P	C
3+1	0	3

TRANSPORTATIONENGINEERING–I(PC2201)

CourseLearningObjectives:

Theobjectivesofthiscourseare:

- To impart different concepts in the field of Highway Engineering.
- To acquire design principles of Highway Geometrics and Pavements
- To learn various highway construction and maintenance procedures

Course Outcomes:

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

- Planhig hway network for a given area.
- DetermineHighwayalignmentanddesign highwaygeometrics.
- Design Intersectionsandpreparetrafficmanagementplans
- Judgesuitabilityofpavementmaterialsandconstruct highways
- Designflexibleandrigidpavementsandmaintain highways

SYLLABUS:

UNIT-I Highway Planning and Alignment: Highway development in India; Classification of Roads; RoadNetworkPatterns;NecessityforHighwayPlanning; 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 control sand criteria- Highway Cross Section Elements- Sight Distance Elements-Stopping sight Distance,OvertakingSightDistanceandIntermediateSightDistance-DesignofHorizontalAlignment-

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, RotaryandChannelizedIntersections; Design of Traffic Signals–WebsterMethod–IRCMethod.

UNIT–IV: Highway MaterialsandConstruction: Subgradesoil: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.Types of Highway Construction –Earthwork; Construction of Earth Roads, Gravel Roads, Water Bound Macadam Roads, Bituminous Pavements and Construction of Cement Concrete Pavements.

UNIT-V Pavement Design and Maintenance: Types of pavements; Functions and, requirements of different components of pavements; DesignFactors ***Flexible Pavements****:* Design factors – Flexible Pavement Design Methods – CBR method –IRCmethod – Burmister method – Mechanistic method – IRC Method for Low volume Flexiblepavements. ***RigidPavements:***DesignConsiderations–wheelloadstresses–Temperaturestresses–Frictionalstresses–Combinationofstresses–Designofslabs–DesignofJoints–IRCmethod–Rigidpavementsforlowvolumeroads–ContinuouslyReinforcedCementConcretePavements–RollerCompactedConcretePavements.Pavement Failures, Maintenance of Highways, pavement evaluation, strengthening of existingpavements

TEXTBOOKS:

1. HighwayEngineering,KhannaS.K.,JustoC.E.GandVeeraragavanA,NemChandBros.,Roorkee.
2. TrafficEngineeringandTransportationPlanning,KadiyaliL.R,KhannaPublishers,NewDelhi.

REFERENCES:

1. PrinciplesofHighwayEngineering,KadiyaliL. R,KhannaPublishers,NewDelhi
2. PrinciplesofTransportationEngineering,ParthaChakroborthyandAnimeshDas,PHILearningPrivateLimited,Delhi
3. Highway Engineering, Paul H. Wright and Karen KDixon,WileyStudentEdition,WileyIndia(P)Ltd.,NewDelhi
4. TransportationEngineering-AnIntroduction,JotinKhistyC,PrenticeHall,EnglewoodCliffs,NewJersey.
5. Traffic&HighwayEngineeringbyNicholasJ.Garber,LesterA.Hoel,FifthEdition,publishedin2015,CENGAGELearning,NewDelhi.
6. TransportationEngineeringandPlanning,PapacostasC.S.andP.D.Prevedouros,PrenticeHallofIndiaPvt.Ltd;NewDelhi.
7. HighwayEngineering, SrinivasaKumarR,UniversitiesPress,Hyderabad.
8. PracticeandDesignofHighwayEngineering,SharmaS.K.,Principles,S.Chand&CompanyPrivateLimited,NewDelhi.
9. HighwayandTraffic Engineering,SubhashC.Saxena,CBSPublishers,NewDelhi.
10. TransportationEngineeringVolumeIbyC.Venkatramaiah, UniversitiesPress,NewDelhi.

IIYear– IISem	**L+T**	**P**	**C**
	3	**0**	**3**

HYDRAULICS AND HYDRAULIC MACHINERY (PC2202)

CourseLearningObjectives:

- To study about uniform and nonuniform flows in open channels
- To introduced imensional analysisforfluid flowproblems
- Tounderstand theworking principlesofvarioustypes ofhydraulicmachinesandPumps.

CourseOutcomes:

Uponsuccessfulcompletionofthis coursethestudentswill beableto:

- Solveuniformand nonuniformopen channelflowproblems.
- applytheprincipals ofdimensional analysisandsimilitude inhydraulicmodeltesting.
- Selectsuitablepumps andturbines.

Syllabus:

UNIT– I :

UNIFORMFLOWINOPENCHANNELS:

Typesofchannels–Typesofflows-Velocitydistribution–Energyandmomentumcorrectionfactors–Chezy'sandManning'sformulaeforuniformflow–MostEconomicalsections, Critical flow: Specific energy-critical depth – computation of critical depth

UNIT II:

NON-UNIFORMFLOWINOPENCHANNELS:

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 dynamicsimilarities-dimensionless numbers–model and prototyperelations.

UNIT–IV:

IMPACT FO 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,expressionsforwork doneand efficiency-Angular momentum principle.

CENTRAIFUGAL-PUMPS: Pump installation details-classification-workdone-Manometrichead-minimum starting speed-lossesandefficiencies-specificspeed, multistage pumps-pumps in parallel and series - performance of pumps-characteristiccurves- NPSH-Cavitation.

UNIT–V:

HYDRAULIC TURBINES–I: Layoutofa typicalHydropower installation– Heads and efficiencies - classification of turbines. Pelton wheel -Francis turbine –Kaplanturbine-working, working proportions, velocitydiagrams, workdone and efficiency, hydraulic design, draft tube – theory and efficiency. Governing of turbines -surgetanks-unitand specific quantities, selection of turbines, performance characteristics-geometricsimilarity-cavitation.

TextBooks:

1. OpenChannelflow,K.Subramanya,TataMcGrawHillPublishers
2. FlowthroughOpenchannelsbyK.G.RangaRaja, TataMcGrawHillPublishers
3. FluidMechanics,andhydraulicmachine,Rajput,SchandPublications.
4. HydraulicsandFluidMechanicsincludingHydraulicmachineryByP.N.Modi, S.MSeth,Standardbookhouse.

References:

1. Openchannelhydraulics byVenTeChow.McGrawHillCompanies
2. FluidMechanicsbyV.L.Streeter,McGraw HillCompanies
3. FluidMechanicsbyK.L.Kumar,S.Chandpunlications.

IIYear –IISem	**L+T**	**P**	**C**
	3+1	**0**	**3**

STRUCTURALANALYSIS–I(ES2201)

CourseLearningObjectives:

- To give preliminary concepts of assessment of bending momentandshearforceinProppedcantilevers,fixedbeamsandcontinuousbeamsduetovarious loadingconditions.
- ToimpartconceptsofBendingMomentandShearforceforbeamswithdifferentboundaryandlo adingconditions.
- The procedure for development of slope deflection equations and to solve applicationtocontinuousbeamswithandwithoutsettlementofsupports.
- Theconceptsofmovingloadsandinfluencelinesareimpartedforassessmentofmaximum SF and BM at a given section when loads of varying spans rolling loads ofPrattandWarrentrusses.

CourseOutcomes:

Uponsuccessfulcompletionofthiscourse thestudentwillbeable to,

- Distinguishbetweenthedeterminateandindeterminatestructures.
- Identifythebehaviorofstructuresduetotheexpectedloads,includingthemovingloads,actingon thestructure.
- Estimatethebendingmomentandshearforcesinbeamsfordifferentfixityconditions.
- Analyzethecontinuousbeamsusingvariousmethods,threemomentmethod,slopedeflectionm ethod,energytheorems.
- Drawtheinfluencelinediagramsfor varioustypesofmovingloadsonbeams/bridges.
- AnalyzetheloadsinPrattandWarrentrusseswhenloadsofdifferenttypesandspansare passingoverthetruss.

Syllabus:

UNIT – I: Columns And Struts: Introduction – Types of columns – Short, medium and longcolumns – Axially loaded compression members – Crushing load – Euler's theorem for longcolumns- assumptions- derivation of Euler's critical load formulae for various end conditions –Equivalent length ofacolumn – slenderness ratio – Euler'scritical stress–Limitations ofEuler's theory – Rankine – Gordon formula – Long columns subjected to eccentric loading – Secant formula – Empirical formulae – Straight line formula – Prof. Perry's formula. Laterallyloaded struts – subjected to uniformly distributed and concentrated loads – Maximum B.M. andstressduetotransverseandlateralloading.

UNIT – II: Direct And Bending Stresses: Stresses under the combined action of direct loadingand B.M. Core of a section – determination of stresses in the case of chimneys, retaining wallsanddams–conditionsforstability–stressesduetodirectloadingandB.M.aboutbothaxis.

Unsymetrical Bending: Introduction – Centroidal principal axes of section –Graphical methodfor locating principal axes – Moments of inertia referred to any set of rectangular axes – Stressesin beams subjected to unsymmetrical bending – Principal axes –Resolution of bending momentinto two rectangular axes through the centroid – Location ofneutral axis Deflection of beamsunderunsymmetricalbending.

UNIT-III:ProppedCantilevers: Analysis ofproppedcantilevers-shear force andBendingmomentdiagrams-Deflectionofproppedcantilevers.

Fixed Beams– Introduction to statically indeterminate beams with U. D. load,central pointload,eccentricpointload,numberofpointloads,uniformlyvaryingload,coupleandcombination of loads - shear force and Bending moment diagrams-Deflection offixed beamsincludingeffect ofsinkingofsupport,effectofrotationofasupport.

UNIT – IV: Continuous Beams: Introduction-Clapeyron's theorem of three moments-Analysisof continuous beams with constant moment of inertia with one or both ends fixed continuousbeams with overhang, continuous beams with different moment of inertia for different spans-EffectsofsinkingofsupportsshearforceandBendingmomentdiagrams.

Slope-Deflection Method: Introduction, derivation of slope deflection equation, application tocontinuousbeamswithandwithoutsettlementofsupports.

UNIT – V:Energy Theorems: Introduction-Strain energy in linear elastic system, expressionofstrain energy due to axial load, bending moment and shear forces - Castigliano's firsttheorem-Deflectionsofsimplebeamsandpinjointedtrusses.

TextBooks:

1. BasicStructuralAnalysis,C.S.ReddyTata Mc.Graw-Hill,NewDelhi.
2. AnalysisofStructuresbyT.S.Thandavamoorthy,OxfordUniversityPress, NewDelhi
3. AnalysisofStructures-
   Vol.IandII,V.N.VaziraniandM.M.Ratwani,KhannaPublishers,NewDelhi

References:

1. TheoryofStructures,B.CPunmia,A.KJain&ArunK.Jain,LakshmiPublications
2. TheoryofStructures,R.S.Khurmi, S.ChandPublishers.
3. StructuralanalysisbyR.C.Hibbeler,Pearson,NewDelhi.
4. StructuralAnalysis-I,HemanthPatel,YogeshPatel,SynergyKnowledgeware,Mumbai
5. StructuralAnalysisIAnalysisofStaticallyDeterminateStructures,P.N.Chandramouli,YesdeePublishingPvtLimited,Chennai.

II Year-II Semester		**L**	**T**	**P**	**C**
		1	**0**	**2**	**2**
BUILDINGPLANNING AND DRAWING (PC2203)					

Objectives of the course:

- Initiatingthestudenttodifferentbuildingbye-lawsandregulations.
- Impartingtheplanningaspectsofresidentialbuildingsandpublicbuildings.
- Givingtrainingexercisesonvarioussignsandbondsanddifferentbuildingunits.
- Impartingtheskillsandmethodsofplanningofvariousbuildings.

Course outcome:

- Uponsuccessfulcompletionofthecourse:
- Studentshouldbeabletoplanvariousbuildingsasperthebuildingby-laws.
- Thestudentshouldbeabletodistinguishtherelationbetweentheplan, elevation and cross section and identify the form and functions among thebuildings.
- The student is expected to learn the skills of drawing building elements andplanthebuildings asperrequirements.

SYLLABUS:

UNITI:BuildingByelawsandRegulations Introduction-terminology-objectivesof building byelaws-floorarearatio-floorspace index- principles under layingbuildingbye laws-classification of buildings- open space requirements – built up area limitations-heightofbuildings-wallthickness–lighteningandventilationrequirements.

UNITII:ResidentialBuildings Minimumstandards forvarious parts of buildings-requirementsofdifferentroomsandtheirgrouping-characteristicsofvarioustypesofresidentialbuildingsandrelationshipbetweenplan,elevationandformsandfunctions

UNITIII:PublicBuildings: Planningofeducationalinstitutions,hospitals,dispensaries, officebuildings,banks,industrialbuildings,hotelsandmotels,buildingsforrecreation,Landscapingrequirements.

UNITIV:SignConventions AndBonds: Brick, stone,plaster,sandfilling, concrete,glass, steel, cast iron, copper alloys, aluminium alloys etc., lead, zinc, tin etc., earth, rock,timberandmarbles.

English bond and Flemish bond - odd and even courses for one, one and half, two and twoandhalfbrickwallsinthicknessatthejunctionofacorner.

UNIT V: Doors, Windows, Ventilators And Roofs : Paneled door, paneled and glazeddoor, glazed windows, paneled windows, swing ventilators, fixed ventilators, coupled roof,collarroofs.

KingPosttruss,QueenPosttruss

Slopedandflatroofandbuildings:drawingplans,ElevationsandCrossSectionsofgivenslopedandflat roofbuildings

P**lanning And Designing Of Buildings:**

DrawthePlan, Elevation and Sections of a Residential and Public buildings from the given line diagram.

TEXTBOOKS:

1. Planning,designingandScheduling,GurcharanSinghandJagadishSingh
2. Buildingplanninganddrawingby M.Chakravarthy.
3. 3.'A'Series&'B'SeriesofJNTUEngineeringCollege,Anantapur,

REFERENCES:

1. Buildingdrawing,MGShah,CMKaleandSYPatki,TataMcGrawHill,NewDelhi.
2. PrinciplesofBuildingDrawing,MGShahandCMKale,TrinityPublications,NewDelhi.
3. CivilEngineeringdrawingandHouseplanning,B.P.Verma, Khannapublishers,NewDelhi.
4. CivilEngineeringBuildingpractice,SurajSingh:CBSPublications,NewDelhi,andChennai I
5. BuildingMaterialsandConstruction,G.CSahaandJoyGopalJana,McgrawHillEducation (P)IndiaLtd.NewDelhi.

II Year–II Sem	**L+T**	**P**	**C**
	3+1	**0**	**3**

CONCRETE TECHNOLOGY(PC2204)

CourseLearning Objectives:

- To learn the concepts of Concrete production and itsbehaviour invariousenvironments.
- To learnthetestproceduresforthe determinationofpropertiesofconcrete.
- To understanddurability propertiesofconcreteinvariousenvironments.

Course Outcomes:

Uponsuccessfulcompletion ofthiscourse,student willbeableto

- Understandthebasicconceptsofconcrete.
- Realizetheimportanceofquality ofconcrete.
- Familiarizethebasicingredientsofconcreteandtheirroleintheproductionofconcreteandits behaviorinthefield.
- Test thefresh concretepropertiesandthehardenedconcreteproperties.
- Evaluatetheingredientsofconcretethroughlabtestresults.designtheconcretemixbyBISmethod.
- Familiarizethebasicconceptsofspecialconcreteandtheirproductionandapplications.Understand thebehaviorofconcreteinvarious environments.

SYLLABUS:

UNIT I : Ingredients Of Concrete Cements & Admixtures: Portland cement – Chemicalcomposition–Hydration,Setting ofcement,Finenessofcement,Structureofhydratecement – Test for physical properties – Different grades of cements – Admixtures – Mineral andchemicaladmixtures– accelerators,retarders,airentrainers,plasticizers,superplasticizers,flyashandsilica fume.

Aggregates: Classification of aggregate – Particle shape & texture – Bond, strength & othermechanical properties of aggregates – Specific gravity, Bulk density, porosity, adsorption &moisture contentof aggregate–Bulkingofsand–Deleterious substance inaggregate–Soundnessofaggregate–Alkaliaggregatereaction–Thermalproperties– Sieveanalysis–

Fineness modulus – Grading curves – Grading of fine & coarse Aggregates – Gap graded andwell graded aggregate as per relevant IS code – Maximum aggregate size. Quality of mixingwater.

UNIT–II:FreshConcrete: StepsinManufactureofConcrete– proportion,mixing,placing,compaction,finishing,curing– includingvarioustypesineachstage.Propertiesoffreshconcrete-Workability–Factorsaffectingworkability– Measurementofworkabilitybydifferenttests,Setting timesofconcrete, Effect oftime andtemperatureon workability–Segregation & bleeding – Mixing and vibration of concrete, Ready mixed concrete, Shotcrete**UNIT – III: Hardened Concrete:** Water / Cement ratio – Abram's Law – Gel space ratio –Nature ofstrengthofconcrete–Maturityconcept–Strengthintension&compression–Factorsaffectingstrength–Relation betweencompression &tensilestrength– Curing,Testingof HardenedConcrete: Compressiontests–Tension tests–Factorsaffectingstrength

–Flexuretests –Splittingtests –Non-destructivetestingmethods – codalprovisionsforNDT. Elasticity,creep& shrinkage, Modulusof elasticity,Dynamicmodulusof elasticity , Poisson's ratio, Creep of concrete, Factors influencing creep, Relation betweencreep &time,Natureofcreep,Effectsofcreep–Shrinkage –typesofshrinkage.

UNIT – IV: Mix Design: Factors in the choice of mix proportions – Durability of concrete – QualityControlofconcrete–Statisticalmethods–Acceptancecriteria–ConceptsProportioningofconcrete mixesbyvariousmethods–BISmethodofmixdesign.

UNIT – V: Special Concretes: Ready mixed concrete, Shotcrete, Light weight aggregateconcrete,Cellularconcrete,No-finesconcrete,Highdensityconcrete,Fibrereinforcedconcrete, Different types of fibres, Factors affecting properties of F.R.C, Polymer concrete,TypesofPolymerconcrete,Propertiesofpolymerconcrete,Highperformanceconcrete– Selfconsolidatingconcrete,SIFCON,selfhealingconcrete.

TextBooks:

1. ConcreteTechnology,M.S.Shetty.–S.Chand &Company
2. ConcreteTechnology, A. R.SanthaKumar, OxfordUniversityPress, NewDelhi

References:

1. PropertiesofConcrete,A.M.Neville–PEARSON– 4thedition
2. ConcreteTechnology,M.L.Gambhir. –TataMc.GrawHillPublishers,NewDelhi

L	T	P	C
3	0	0	3

MANAGERIAL ECONOMICS AND FINANCIAL ANALYSIS(PC2205)
(Common to all Branches)

Course Objectives:

- The Learning objectives of this paper is 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, 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.

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 (pay back period, accounting rate of return) and modern methods (Discounted cash flow method, Net Present Value method, Internal Rate of Return Method and Profitability Index)

Course Outcome:

- The Learner is equipped with the knowledge of estimating the Demand and demand elasticities for a product and the knowledge of understanding of the Input-Output-Cost relationships and estimation of the least cost combination of inputs.
- One 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 and to evaluate various investment project proposals with the help of capital budgeting techniques for decision making.

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. Sakthivel Murugan, Accounting for Management, S. Chand & Company Ltd,
4. Maheswari S.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,

IIYEAR-IISEM	**SURVEYINGFIELDWORK-II(PC2206)**	**L+T**	**PC**
		0	**32**

Listofexperiments

1. Theodolite survey : determining the horizontal and vertical angles by the method ofrepetitionmethod.
2. Theodolitesurvey:findingthedistancebetweentwoinaccessiblepoints.
3. Theodolitesurvey:findingtheheightoffarobject.
4. Tacheometricsurvey:heightsanddistanceproblemsusingtacheometricprinciples.
5. Oneexerciseoncurvesetting.
6. Oneexerciseoncontours.
7. Total station: introduction to total station and practicing setting up, levelling up andeliminationofparallax error.
8. Totalstation:determinationofareausingtotalstation.
9. Totalstation:traversing.
10. Totalstation:contouring.
11. Totalstation:determinationofremoteheight.
12. Totalstation:distancebetweentwoinaccessiblepoints.

NOTE1:any10fieldworkassignmentsmustbecompleted.

IIYear– I SEMESTER	**Fluid Mechanics Lab(PC2207)**	**LT**	**PC**
		0 0	**3 1.5**

1. VerificationofBernoullis'equation.
2. CalibrationofVenturimeter.
3. Calibration of orificemeter.
4. Determination ofcoefficient ofdischargeof asmall orificeby constant head method
5. Determinationofcoefficientofdischargeofanexternalcylindricalmouthpiecebyvariablehead method.
6. Calibrationofacontractedrectangularnotch.
7. Calibrationofatriangularnotch.
8. Determination of frictionfactor ofthepipematerial.
9. Determinationofcoefficientofdeadlossduetoasuddenexpansion/contractioninapipeline.
10. Determinationofhead losscoefficientdue toabend inpipeline.

II Year – II Semester		**L**	**T**	**P**	**C**
		0	**0**	**2**	**1**
Socially Relevant Project(MC2201)					

Preamble:

There is lot of scientific and technological changes in the nation during last few decades in almost all the sectors. The state and central governments are introducing many schemes to all classes of people of the nation to increase the productivity in various sectors. India is a rural centric nation and the fruits of the scientific inventions and new technology shall be shared among all remote corners of the nation. With this aim, a socially relevant project is newly introduced in the curriculum with an objective of taking up the projects relevant to the societalneeds.

Objectives:

(1) The student(s) shall explore the technological needs ofsociety
(2) The student(s) shall understand the technological problems ofsociety

General guidelines:

- A socially relevant project shall be a community service based project and it shall beinnovative.
- A student has to pursue the socially relevant project to solve real life and pressing problems ofsociety.
- The pursued socially relevant projects shall contribute to national development goals andpriorities.
- Socially relevant project can be carried out by an individual student or by a team of maximum 5 of concerneddepartment.
- The student(s) shall visit the society (Villages/Hospitals/Social Service Organizations etc) to identify the problem and conduct literature survey and provide a feasiblesolution.
- The socially relevant project selected shall be in the broad area of concerned discipline of course. Preference shall be given to rural societalproblems.
- Each team shall work under the supervision of a faculty member of the concerneddepartment.
- If the course is offered in II Year I Semester, the student or team of students shall complete this project during the vacation after I Year and soon.
- The duration of the project is about 15 to 20 hrs in total and students may split total duration into 2 to 3 hrs per day based convenience. The attendance shall be maintained by thesupervisor.

Sample Projects (but not limited to):
(i) Energy Auditing in a rural village (ii) Smart starting and control of motors in agriculture and aqua fields (iii) TV Remote Operated Domestic Appliances Control (iv) Solar Powered Auto Irrigation System (v) Auto Intensity Control of Street Lights (vi) Hidden Active Cell Phone Detector (vii) Railway Track Security System (viii) Solar Power Charge Controller (ix) Home Automation System Using Digital Control (x) Intelligent Overhead Tank Water Level Indicator (xi) Pre Stampede Monitoring and Alarm System (xii) Detect Rash Driving Speed Checker System on Highways

Outcomes

(1) The student(s) are be able to provide a solutions the technological problems of society

(1) The student(s) is able suggest technological changes which suits current needs ofsociety
(2) The student(s) are able to explain new technologies available for problems of the society.
Reference:
(1) Web Link:http://iitk.ac.in/new/socially-relevant-research
(2) https://csie.iitm.ac.in/SocialProjectsIITM.html
(3) http://www.iitkgp.ac.in/files/csr/csr_education.pdf

II Year – II Semester		**L**	**T**	**P**	**C**
		2	**0**	**0**	**0**
Essence of Indian Traditional Knowledge / Professional Ethics and Human Values(MC2202)					

Essence of Indian Traditional Knowledge Course Objectives

The course is introduced

- To get a knowledge in IndianPhilosophicalFoundations.
- To Know Indian Languages and Literature and the fine arts in India &TheirPhilosophy.
- To explore the Science and Scientists of Medieval andModernIndia

Course Outcomes

After successful completion of the course the students will be able to

1. Understand philosophy ofIndianculture.
2. Distinguish the Indian languages and literature amongdifferencetraditions.
3. Learn the philosophy of ancient, medieval andmodernIndia.
4. Acquire the information about the fine artsinIndia.
5. Know the contribution of scientists of differenteras.
6. The essence of Yogic Science for Inclusivenessofsociety.

UNIT – I

Introduction to Indian Philosophy: Basics of Indian Philosophy, culture, civilization, culture and heritage, general characteristics of culture, importance of culture in human literature, Indian culture, Ancient Indian, Medieval India, Modern India.

UNIT – II

Indian Philosophy & Literature: Vedas Upanishads, schools of Vedanta, and other religion Philosophical Literature. Philosophical Ideas the role of Sanskrit, significance of scriptures to current society, Indian Philosophies, literature of south India.

Indian languages and Literature-II: Northern Indian languages & Philosophical & cultural & literature.

UNIT –III

Religion and Philosophy: Religion and Philosophy in ancient India, Religion and Philosophy in Medieval India, Religious Reform Movements in Modern India (selected movements only)

UNIT – IV

Indian Fine Arts & Its Philosophy (Art, Technology & Engineering): Indian Painting, Indian handicrafts, Music, divisions of Indian classic music, modern Indian music, Dance and Drama,

Indian Architecture (ancient, medieval and modern), Science and Technology in Indian, development of science in ancient, medieval and modern Indian.

UNIT – V

Education System in India: Education in ancient, medieval and modern India, aims of education, subjects, languages, Science and Scientists of Ancient India, Scientists of Medieval India, Scientists of Modern India. The role Gurukulas in Education System, Value based Education.

Suggested Readings:

1. Kapil Kapoor, "Text and Interpretation: The India Tradition'', ISBN:81246033375,2005
2. "Science in Samskrit", Samskrita BhartiPublisher,ISBN-13:978-8187276333,2007
3. NCERT, "Position paper on Arts, Music, Dance and Theatre'', ISBN81-7450-494-X,2006
4. S. Narain, "Examination in Ancient India", Arya Book Depot,1993
5. Satya Prakash, "Founders of Sciences in Ancient India", Vijay KumarPublisher,1989
6. M.Hiriyanna, "Essentials of Indian Philosophy", Motilal Banarsidass Publishers,ISBN-13: 978-8120810990,2014
7. Chatterjee. S & Dutta "An Introduction toIndianPhilosophy"

(or)

PROFESSIONAL ETHICS AND HUMAN VALUES

Course Objectives: To give basic insights and inputs to the student to inculcate Human values to grow as a 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/sInvoluntary Risk – Consequences - Risk Assessment – Accountability – Liability - Reversible Effects - Threshold Levels of Risk - Delayed v/sImmediate 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-WhistleBlowing.

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 be dealt where evernecessary.

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. Subramaniam – Oxford Publications, NewDelhi.
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 Rabins, Cengage Learning, NewDelhi.
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.SenthilKumar-PHI Learning Pvt. Ltd –2009.
7. Professional Ethics and Human Values by A. Alavudeen, R.Kalil Rahman and M. Jayakumaran – University SciencePress.
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

III B.Tech- Civil Engineering- I Semester

STRUCTURAL ANALYSIS – II(PC3101)

Lecture :	3 hrs/Week	Internal Assessment :	30 Marks
Tutorial :	1 hr/Week	Semester End Examination :	70 Marks
Practical :	--	Credits :	3

Course Learning Objectives:

The objective of this course is to

1. Familiarize Students with Different types of Structures
2. Equip student with concepts of Arches
3. Enable the students understand Concepts of lateral Load analysis
4. Enable the students analyze Cables and Suspension Bridge structures.
5. Enable the students to learn Moment Distribution method, Kanis Method and Matrix methods of Structural Analysis.

Course Outcomes:

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

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

SYLLABUS:

UNIT I

Three Hinged Arches: Elastic theory of arches – Eddy's theorem – Determination of horizontal thrust, bending moment, normal thrust and radial shear – effect of temperature.

Two Hinged Arches: Determination of horizontal thrust, bending moment, normal thrust and radial shear – Rib shortening and temperature stresses, tied arches – fixed arches – (No analytical question).

UNIT-II

Lateral Load Analysis Using Approximate Methods: application to building frames. (i) Portal method (ii) Cantilever method.

Kani's Method : Analysis of continuous beams – including settlement of supports and single bay portal frames with and without side sway.

UNIT – III

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 – IV

Moment Distribution Method: Stiffness and carry over factors – Distribution factors – Analysis of continuous beams with and without sinking of supports – Portal frames – including Sway-Substitute frame analysis by two cycle.

UNIT – V

Introduction to Matrix Stiffness Methods:

Stiffness method: Introduction, application to continuous beams (maximum of two unknowns) including support settlements, simple trusses and frames with solution to maximum of three unknowns.

TEXT BOOKS:

1. 'Structural Analysis' by T.S.Thandavamoorthy, Oxford university press, India.
2. 'Structural Analysis' by R.C. Hibbeler, Pearson Education, India
3. 'Theory of Structures – II' by B.C.Punmia, Jain & Jain, Laxmi Publications, India.
4. 'Structural Analysis' by C.S. Reddy, Tata Mc-Graw hill, New Delhi.
5. 'A first course in the Finite Element Method' by Daryl L. Logan, Thomson Publications.
6. 'Introduction to Finite Elements in Engineering' by Tirupati R. Chandrupatla, Ashok D. Belgundu, PHI publications.,
7. Matrix and Finite Element Analyses of Structures (With computer programs in both FORTRAN and C) by Madhujit Mukhopadyay, Abdul Hamid Sheikh, Ane Books Pvt. Ltd.

REFERENCES:

1. 'Intermediate Structural Analysis' by C. K. Wang, Tata McGraw Hill, India

III B.Tech- Civil Engineering- I Semester

DESIGN AND DRAWING OF REINFORCED CONCRETE STRUCTURES (PC3102)

Lecture :	4 hrs/Week	Internal Assessment :	30 Marks
		Semester End Examination :	70 Marks
Practical :	1 Drawing class/Week	Credits :	3

Course Learning Objectives:

The objective of this course is:

1. Familiarize Students with different types of design philosophies
2. Equip student with concepts of design of flexural members
3. Understand Concepts of shear, bond and torsion
4. Familiarize students with different types of compressions members and Design
5. Understand different types of footings and their design

Course Outcomes:

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

a. Work on different types of design philosophies
b. Carryout analysis and design of flexural members and detailing
c. Design structures subjected to shear, bond and torsion
d. Design different type of compression members and footings

SYLLABUS:

UNIT –I

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

Limit State Design: Concepts of limit state design – Basic statistical principles – Characteristic loads – Characteristic strength – Partial load and safety factors – representative stress-strain curves for cold worked deformed bars and mild steel bars. Assumptions in limit state design – stress - block parameters – limiting moment of Resistance

UNIT –II

Design for Flexure: Limit state analysis and design of singly reinforced sections- effective depth- Moment of Resistance- Doubly reinforced and flanged (T) beam sections- Minimum depth for a given capacity- Limiting Percentage of Steel- Minimum Tension Reinforcement-Maximum Flexural Steel- Design of Flanged Sections (T)- Effective width of flange –Behavior- Analysis and Design.

UNIT – III

Design for Shear, Torsion and Bond: Limit state analysis and design of section for shear and torsion for L Beam – concept of bond, anchorage and development length, I.S. code provisions. Design examples in simply supported and continuous beams, detailing.**Limit state design for serviceability:** Deflection, cracking and code provision.

UNIT – IV

Design of Compression members: Effective length of a column, Design of short and long columns – under axial loads, uniaxial bending and biaxial bending – Braced and un-braced columns – I S Code provisions.

Footings: Different types of footings – Design of isolated footings, Square footings – Rectangular footings – circular footing – spread & sloped footings - subjected to axial loads.

UNIT – V

Slabs: Classification of slabs, design of one - way slabs, two - way slabs, and continuous slabs using IS Coefficients (conventional), design of waist-slab staircase.

NOTE: All the designs to be taught in Limit State Method. Drawing classes must be conducted every week and the Following plates should be prepared by the students.

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

TEXT BOOKS:

1. 'Limit State Design' by A. K. Jain
2. 'Reinforced Concrete Structures' by S. Unnikrishna Pillai & Devdas Menon, Tata Mc.Graw Hill, New Delhi.
3. 'Design of Reinforced concrete Structures' by N. Subrahmanyian

REFERENCES:

1. 'Design of concrete structures' by N. Krishna Raju.
2. 'Reinforced Concrete Structures' by Park and Pauley, John Wiley and Sons.

IS Codes:

1) IS -456-2000 (Permitted to use in examination hall)
2) IS – 875
3) SP-16

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III B.Tech- Civil Engineering- I Semester

ENVIRONMENTAL ENGINEERING – I (PC3103)

Lecture :	3 hrs/Week	Internal Assessment :	30 Marks
Tutorial :	1 hr/Week	Semester End Examination :	70 Marks
Practical :	--	Credits :	3

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

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, Flow chart of public water supply system, Role of Environmental Engineer, Agency activities

Water Demand and Quantity Estimation: Estimation of water demand for a town or city, Per capita Demand and factors influencing it - Types of water demands and its variations- factors affecting water demand, Design Period, Factors affecting the Design period, Population Forecasting.

UNIT-II

Sources of Water: Lakes, Rivers, Impounding Reservoirs, comparison of sources with reference to quality, quantity and other considerations- Capacity of storage reservoirs, Mass curve analysis. Groundwater sources of water: Types of water bearing formations, springs, Wells and Infiltration galleries, Yields from infiltration galleries.

Collection and Conveyance of Water: Factors governing the selection of the intake structure, Types of Intakes. Conveyance of Water: Gravity and Pressure conduits, Types of Pipes, Pipe Materials, Pipe joints, Design aspects of pipe lines, laying of pipe lines

UNIT-III

Quality and Analysis of Water: Characteristics of water–Physical, Chemical and Biological-Analysis of Water – Physical, Chemical and Biological characteristics. Comparison of sources with reference to quality-I.S. Drinking water quality standards and WHO guidelines for drinking water

UNIT–IV

Treatment of Water: Flowchart of water treatment plant, Treatment methods: Theory and Design of Sedimentation, Coagulation, Sedimentation with Coagulation, Filtration

UNIT-V

Disinfection: Theory of disinfection-Chlorination and other Disinfection methods, Softening of Water, Removal of color and odours - Iron and manganese removal –Adsorption-fluoridation and deflouridation–aeration–Reverse Osmosis-Ion exchange–Ultra filtration, RO plant-Design operation & Maintenance.

UNIT–VI

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 -Components of Distribution system: valves such as sluice valves, air valves, scour valves and check valves, hydrants, and water meters–Laying and testing of pipe lines- selection of pipe materials, pipe joints, visit a water treatment plant and report with technical details.

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, Reem Publications, New Delhi, 2012

REFERENCES

1. Water Supply Engineering – Dr. 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 by D. Srinivasan, PHI Learning Private Limited, New Delhi, 2011.
5. Elements of Environmental Engineering – K.N. Duggal, S. Chand & Company Ltd., New Delhi, 2012.

III B.Tech- Civil Engineering- I Semester

GEOTECHNICAL ENGINEERING – I (PC3104)

Lecture :	3 hrs/Week	Internal Assessment :	30Marks
Tutorial :	1 Hrs/Week	Semester End Examination :	70Marks
Practical :	--	Credits :	3

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:

CO1: Able to understand Soil exploration methods and field tests.

CO2: Able to understand earth pressure theories.

CO3: Able to understand stability of slopes.

CO4: Able to analyse the shallow foundations.

CO5: Able to analyse the deep foundations.

SYLLABUS:

UNIT – I:

Soil Exploration: Need – Methods of soil exploration – Boring and Sampling methods – Plate load test – Standard Penetration and cone penetration.

Earth Pressure theories: Rankine's & Coulomb's theory of earth pressure – Culmann's graphical method - earth pressures in layered soils.

UNIT – II:

Stability of Slopes: 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 – Bishop's method -- Taylor's Stability Number-Stability of slopes of dams and embankments - different conditions.

Shallow foundations – Terzaghi's and Meyerhoff's bearing capacity theories, effect of water table; Combined footing and raft foundation; Contact pressure; Settlement analysis in sands and clays;

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 Meyerhof theory- IS Methods – effect of water table.

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.

Design of Shallow Foundations:

Proportioning of footings for Equal Settlement — Combine footing -- Rectangular, Trapezoidal and Strap footing – Principles of Design of Raft Foundation.

UNIT –V:

Pile Foundation: Types of piles – Load carrying capacity of piles based on static pile formulae – Dynamic pile formulae– Pile load test – Pile under lateral loading -- Load carrying capacity of pile groups in sands and clays – Negative Skin Friction.

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, Newyork.
2. 'Theory and Practice of Foundation Design' by N.N.SOM & S.C.DAS PHI Learning Private limited.

III B.Tech- Civil Engineering- I Semester

WATER RESOURCES ENGINEERING–I (PC3105)

Lecture :	3 hrs/Week	Internal Assessment :	30 Marks
Tutorial :	1 hr/Week	Semester End Examination :	70 Marks
Practical :	--	Credits :	3

Course Learning Objectives:

The course is designed to make the students;

1. Understand hydrologic cycle and its relevance to Civil engineering
2. Learn physical processes and their interactions in hydrology
3. Learn measurement and estimation of the components of hydrologic cycle
4. Have an overview and understanding of Hydrographs
5. Learn flood frequency analysis, design flood and flood routing methods
6. Study the concepts of groundwater movement and well hydraulics

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
g. Estimate flood magnitude and carry out flood routing
h. Determine aquifer parameters and yield of wells

SYLLABUS:

UNIT –I:

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

UNIT-II:

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

UNIT-III:

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

UNIT-IV :

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

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

UNIT-V :

Groundwater: Occurrence, types of aquifers, aquifer parameters, porosity, specific yield, permeability, transmissivity and storage coefficient, types of wells, Darcy's law, Dupuit's equation- steady radial flow to wells in confined and unconfined aquifers, yield of an open well-recuperation test.

TEXT BOOKS:

1. 'Engineering Hydrology' by Subramanya, K, Tata McGraw-Hill Education Pvt Ltd, (2013), New Delhi.
2. 'Engineering Hydrology' by Jayarami Reddy, P, Laxmi Publications Pvt. Ltd., (2013), New Delhi
3. 'Applied hydrology' by Chow V.T., D.R Maidment and L.W. Mays, Tata McGraw Hill Education Pvt Ltd, (2011), New Delhi.
4. 'Engineering Hydrology' by Ojha C.S.P, R. Berndtsson and P. Bhunya, Oxford University Press, (2010).

REFERENCES:

1. 'Water Resources Engineering', Mays L.W, Wiley India Pvt. Ltd, (2013).
2. 'Hydrology' by Raghunath. H.M., New Age International Publishers, (2010)
3. 'Engineering Hydrology –Principles and Practice' by Ponce V.M., Prentice Hall International, (1994)
4. 'Hydrology and Water Resources Engineering' by Patra K.C., Narosa Publications, (2011).

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III B.Tech- Civil Engineering- I Semester

GEOTECHNICAL ENGINEERING LAB (PC3106)

Lecture :	--	Internal Assessment :	25 Marks
Tutorial :	--	Semester End Examination :	50 Marks
Practical :	3 hrs/Week	Credits :	2

Learning Objectives:

The objective of this course is:

1. To impart knowledge of determination of index properties required for classification of soils.
2. To teach how to determine compaction characteristics and consolidation behaviour 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.

III B.Tech- Civil Engineering- I Semester

CONCRETE TECHNOLOGY LAB (PC3107)

Lecture :	--	Internal Assessment :	25Marks
Tutorial :	--	Semester End Examination :	50Marks
Practical :	3 hrs/Week	Credits :	2

Learning Objectives:

To test the basic properties ingredients of concrete, fresh and hardened concrete properties

Outcomes:

Upon successful completion of this Laboratory experiments, the student will be able to understand and determine

- The consistency and fineness of cement.
- The setting times of cement.
- The specific gravity and soundness of cement.
- The compressive strength of cement.
- The workability of cement concrete by compaction factor, slump and Vee – Bee tests
- The specific gravity of coarse aggregate and fine aggregate by Sieve analysis.
- The flakiness and elongation index of aggregates.
- The bulking of sand.
- Non-destructive testing procedures on concrete.

List of Experiments:

Cement

1. Normal Consistency, fineness and Soundness (Le-Chatlier's permeability apparatus)
2. Initial setting time and final setting time.
3. Specific gravity and compressive strength.

Fine Aggregate

4. Grading and fineness modulus by sieve analysis, Specific gravity, Bulking of sand.

Coarse Aggregate

5. Grading and fineness modulus by sieve analysis, Specific gravity, crushing strength.

Wet Concrete

6. Workability by slump test, Compaction Factor method and Vee-bee test.
7. Self Compacting Concrete- Flowability Test

Hardened Concrete

8. Compressive strength, Split Tensile strength and Modulus of rupture
9. Young's Modulus and Poisson's ratio
10. Non-Destructive testing on concrete using rebound hammer and UPV.

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 meter etc.

II Year – II Semester		**L**	**T**	**P**	**C**
		0	**0**	**3**	**1.5**
Hydraulic Machinery Lab (PC3108)					

List of Experiments

1. Calibration of Venturi meter & Orificemeter
2. Determination of Coefficient of discharge for a small orifice and mouth piece bya constant head and variable headmethod.
3. Calibration of contracted Rectangular Notch and /or TriangularNotch
4. Determination of Coefficient of loss of head in a sudden contraction and frictionfactor.
5. Verification of Bernoulli'sequation.
6. Impact of jet onvanes
7. Study of Hydraulicjump.
8. Performance test on Pelton wheelturbine
9. Performance test on Francisturbine.
10. Efficiency test on centrifugalpump.
11. Efficiency test on reciprocatingpump.

List of Equipment:

1. Venturi metersetup.
2. Orifice metersetup.
3. Small orificesetup.
4. External mouth piecesetup.
5. Rectangular and Triangular notch setups.
6. Friction factor testsetup.
7. Bernoulli's theoremsetup.
8. Impact ofjets.
9. Hydraulic jump testsetup.
10. Pelton wheel, Francis turbine and kalpanturbines
11. Centrifugal and Reciprocatingpumps.

III Year – I Semester		**L**	**T**	**P**	**C**
		0	**0**	**2**	**1**
Socially Relevant Project (SR3101)					

Preamble:

There is lot of scientific and technological changes in the nation during last few decades in almost all the sectors. The state and central governments are introducing many schemes to all classes of people of the nation to increase the productivity in various sectors. India is a rural centric nation and the fruits of the scientific inventions and new technology shall be shared among all remote corners of the nation. With this aim, a socially relevant project is newly introduced in the curriculum with an objective of taking up the projects relevant to the societalneeds.

Objectives:

(3) The student(s) shall explore the technological needs ofsociety
(4) The student(s) shall understand the technological problems ofsociety
General guidelines:

- A socially relevant project shall be a community service based project and it shall beinnovative.
- A student has to pursue the socially relevant project to solve real life and pressing problems ofsociety.
- The pursued socially relevant projects shall contribute to national development goals andpriorities.
- Socially relevant project can be carried out by an individual student or by a team of maximum 5 of concerneddepartment.
- The student(s) shall visit the society (Villages/Hospitals/Social Service Organizations etc) to identify the problem and conduct literature survey and provide a feasiblesolution.
- The socially relevant project selected shall be in the broad area of concerned discipline of course. Preference shall be given to rural societalproblems.
- Each team shall work under the supervision of a faculty member of the concerneddepartment.
- If the course is offered in II Year I Semester, the student or team of students shall complete this project during the vacation after I Year and soon.
- The duration of the project is about 15 to 20 hrs in total and students may split total duration into 2 to 3 hrs per day based convenience. The attendance shall be maintained by thesupervisor.

Sample Projects (but not limited to):
(i) Energy Auditing in a rural village (ii) Smart starting and control of motors in agriculture and aqua fields (iii) TV Remote Operated Domestic Appliances Control (iv) Solar Powered Auto Irrigation System (v) Auto Intensity Control of Street Lights (vi) Hidden Active Cell Phone Detector (vii) Railway Track Security System (viii) Solar Power Charge Controller (ix) Home Automation System Using Digital Control (x) Intelligent Overhead Tank Water Level Indicator (xi) Pre Stampede Monitoring and Alarm System (xii) Detect Rash Driving Speed Checker System on Highways

Outcomes

(1) The student(s) are be able to provide a solutions the technological problems of society

(3) The student(s) is able suggest technological changes which suits current needs ofsociety
(4) The student(s) are able to explain new technologies available for problems of the society.
Reference:
(4) Web Link:http://iitk.ac.in/new/socially-relevant-research
(5) https://csie.iitm.ac.in/SocialProjectsIITM.html
(6) http://www.iitkgp.ac.in/files/csr/csr_education.pdf

III B.Tech- Civil Engineering- II Semester

DESIGN AND DRAWING OF STEEL STRUCTURES(PC3201)

Lecture :	4 hrs/Week	Internal Assessment :	30 Marks
		Semester End Examination :	70 Marks
Practical :	1 Drawing class/Week	Credits :	3

Course Learning Objectives:

The objective of this course is to:

1. Familiarize students with different types of connections and relevant IS codes
2. Equip student with the concepts of designing flexural members
3. Understand design concepts of tension and compression members in trusses
4. Familiarize students with different types of columns and column bases and their design
5. Familiarize students with Plate girder and Gantry Girder and their design

Course Outcomes:

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

a. Analyze and design steel structural members with relevant IS codes
b. Carryout analysis and design of flexural members and detailing
c. Design compression members of different types with connection detailing
d. Design Plate Girder and Gantry Girder with connection detailing
e. Produce the drawings pertaining to different components of steel structures

SYLLABUS:

UNIT – I

Connections: Riveted connections – definition, rivet strength and capacity, Welded connections: Introduction, Advantages and disadvantages of welding- Strength of welds-Butt and fillet welds: Permissible stresses – IS Code requirements. Design of fillet weld subjected to moment acting in the plane and at right angles to the plane of the joints.

UNIT – II

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.

UNIT –III

Tension Members and compression members: Effective length of members, slenderness ratio-permissible stresses. Design compression members subjected to axial and eccentric loading. Design of members subjected to direct tension and bending. **Roof Trusses:** Different types of roof trusses – Design loads – Load combinations as per IS Code recommendations, structural details –Design of purlins, members and joints.

UNIT – IV

Design of Columns: Built up compression members – Design of lacings and battens. Design Principles of Eccentrically loaded columns, Splicing of columns.

Design of Column Foundations: Design of slab base and gusseted base. Column bases subjected to 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. Drawing classes must be conducted every week and 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 of Column 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.
Plate 6 Detailing of Plate girder including curtailment, splicing and stiffeners.
Plate 7 Detailing of gantry girder.

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' by N.Subramanian, Oxford University Press.
2. 'Design of Steel Structures' by Ramachandra, Vol – 1, Universities Press.
3. 'Design of steel structures' by S.K. Duggal, Tata Mcgraw Hill, and New Delhi

REFERENCES

1. 'Structural Design in Steel' by Sarwar Alam Raz, New Age International Publishers, New Delhi
2. 'Design of Steel Structures' by P. Dayaratnam; S. Chand Publishers
3. 'Design of Steel Structures' by M. Raghupathi, Tata Mc. Graw-Hill
4. 'Structural Design and Drawing' by N. Krishna Raju; University Press,

IS Codes:

1) IS -800 – 2007
2) IS – 875
3) Steel Tables.

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

III B.Tech- Civil Engineering- II Semester

GEOTECHNICAL ENGINEERING – II (PC3202)

Lecture :	3 hrs/Week	Internal Assessment :	30Marks
Tutorial :	1 Hrs/Week	Semester End Examination :	70Marks
Practical :	--	Credits :	3

Course Learning Objectives:

The objective of this course is:

5. To impart to the student knowledge of types of shallow foundations and theories required for the determination of their bearing capacity.
6. To enable the student to compute immediate and consolidation settlements of shallow foundations.
7. To impart the principles of important field tests such as SPT and Plate bearing test.
8. 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:

CO1: Able to understand Soil exploration methods and field tests.

CO2: Able to understand earth pressure theories.

CO3: Able to understand stability of slopes.

CO4: Able to analyse the shallow foundations.

CO5: Able to analyse the deep foundations.

SYLLABUS:

UNIT – I:

Soil Exploration: Need – Methods of soil exploration – Boring and Sampling methods – Plate load test – Standard Penetration and cone penetration.

Earth Pressure theories: Rankine's & Coulomb's theory of earth pressure – Culmann's graphical method - earth pressures in layered soils.

UNIT – II:

Stability of Slopes: 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 – Bishop's method -- Taylor's Stability Number-Stability of slopes of dams and embankments - different conditions.

Shallow foundations – Terzaghi's and Meyerhoff's bearing capacity theories, effect of water table; Combined footing and raft foundation; Contact pressure; Settlement analysis in sands and clays;

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 Meyerhof theory- IS Methods – effect of water table.

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.

Design of Shallow Foundations:

Proportioning of footings for Equal Settlement — Combine footing -- Rectangular, Trapezoidal and Strap footing – Principles of Design of Raft Foundation.

UNIT –V:

Pile Foundation: Types of piles – Load carrying capacity of piles based on static pile formulae – Dynamic pile formulae– Pile load test – Pile under lateral loading -- Load carrying capacity of pile groups in sands and clays – Negative Skin Friction.

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, Newyork.
2. 'Theory and Practice of Foundation Design' by N.N.SOM & S.C.DAS PHI Learning Private limited.

III B.Tech- Civil Engineering- II Semester

TRANSPORTATION ENGINEERING – II (PC3203)

Lecture :	3 hrs/Week	Internal Assessment :	30 Marks
Tutorial :	1 Hrs/Week	Semester End Examination :	70 Marks
Practical :	--	Credits :	3

Course Learning Objectives:

The objective of this course is:

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.

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.

UNIT – V

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 – VI

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

III Year – II Semester		**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**
PROGRAM ELECTIVE – I (PE3201) a) CONSTRUCTION TECHNOLOGY & MANAGEMENT					

Course LearningObjectives:

The objective of this courseis:

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

Course Outcomes**:**

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

a) appreciate the importance of constructionplanning
b) understand the functioning of various earth movingequipment
c) know the methods of production of aggregate products and concreting and usage of machinery required for theworks.
d) apply the gained knowledge to project management and constructiontechniques

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 – Applications

UNIT -II Project Evaluation and Review Technique – cost analysis - updating – crashing for optimum cost – crashing for optimum resources – allocation of resources

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

UNIT -IV Concreting equipment – crushers – jaw crushers – gyratory crushers – impact crushers – selection of crushing equipment - screening of aggregate – concrete mixers – mixing and placing of concrete – consolidating andfinishing

UNIT –V Construction methods – earthwork – piling – placing of concrete – form work – fabrication and erection – quality control and safety engineering

Text Books:

1. Construction Planning Equipment and Methods, Peurifoy and Schexnayder , Shapira, Tata Mcgrawhill
2. Construction Project Management Theory and Practice, Kumar NeerajJha (2011),Pearson.
3. Construction Technology, Subir K. Sarkar and Subhajit Saraswati, Oxford Universitypress.
4. Project Planning and Control with PERT and CPM, B. C. Punamia and K K Khandelwal, Laxmi Publications Pvt Ltd.Hyderabad.

References:

1. Construction Project Management - An Integrated Approach, Peter Fewings , Taylor and Francis
2. Construction Management Emerging Trends and Technologies, Trefor Williams, Cengagelearning.
3. Hand Book of Construction Management, P. K. Joy, Trinity Press Chennai, NewDelhi.

III Year – II Semester		**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**
PROGRAM ELECTIVE– I (PE3201) b) ENVIRONMENTAL IMPACT ASSESSMENT					

Course Learning Objectives:

The objective of this course:

1. To impart knowledge on different concepts of Environmental ImpactAssessment
2. To know procedures of risk assessment
3. To learn the EIA methodologies and the criterion for selection of EIAmethods
4. To know pre-requisites for ISO14001certification
5. To know the procedures for environmental clearances andaudit
6. To appreciate the importance of stakeholder participation inEIA

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 aproject
b) Selection of an appropriate EIAmethodology
c) Evaluation of impacts onenvironment
d) Evaluation of riskassessment
e) Know the latest acts and guidelines of MoEF & CC

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 - 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, 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 variousIndustries.

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., NewDelhi.

3. Environmental Pollution and Control, H. S. Bhatia, Galgotia Publication (P) Ltd,Delhi.

c) ROAD SAFETY ENGINEERING

III B.Tech- Civil Engineering- II Semester

PROGRAM ELECTIVE – I (PE3201) d) Industrial Wastewater Treatment

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 quantitygeneration.
2. To impart knowledge on selection of treatment methods for industrialwastewater.
3. To know the common methods of treatment in differentindustries
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:

a. Know the quality and quantity of water for various industries and Advanced water treatmentmethods
b. Learn the common methods of treatment of wastewaters and Biological treatment methods
c. Study of methods to reduce impacts of disposal of wasters into environment and CETPs.
d. Study of methods of treatment of wastewaters from specific industries like steel plants, refineries, and power plants, that imply biological treatmentmethods
e. Study of methods of treatment of wastewaters from industries like Aqua, dairy, sugar plants, and distilleries that imply biological treatmentmethods

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 ofsewage.

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.

Text books

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,NewDelhi.
3. Industrial Wastewater treatment by A.D. Patwardhan, PHILearning,Delhi
4. Wastewater Treatment for Pollution Control and Reuse, by Soli. J Arceivala, Shyam R Asolekar, Mc-Graw Hill, New Delhi;3rdEdition

References

1. Industrial Water Pollution Control by W. Wesley Eckenfelder, Mc- GrawHill, ThirdEdition
2. Wastewater Engineering by Metcalf and EddyInc, Tata McGrawhillCo., NewDelhi
3. Wastewater Treatment- Concepts and Design Approach by G.L. Karia & R.A. Christian, Prentice Hall ofIndia.
4. Unit Operations and Processes in Environmental Engineering by Reynolds. Richard,Cengage Learning.

III B.Tech- Civil Engineering- II Semester

ENVIRONMENTAL ENGINEERING – II (PC3204)

Lecture :	3 hrs/Week	Internal Assessment :	30Marks
Tutorial :	1 Hrs/Week	Semester End Examination :	70Marks
Practical :	--	Credits :	3

Course Learning Objectives:

The objective of this course is:

1. Outline planning and the design of wastewater collection, conveyance and treatment systems for a community/town/city
2. Provide knowledge of characterisation of wastewater generated in a community
3. Impart understanding of treatment of sewage and the need for its treatment.
4. Summarize the appurtenance in sewerage systems and their necessity
5. Teach planning, and design of septic tank and imhoff tank and the disposal of the effluent from these low cost treatment systems
6. Effluent disposal method and realise the importance of regulations in the disposal of effluents in rivers

Course Outcomes:

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

a. Plan and design the sewerage systems
b. Characterisation of Sewage
c. Select the appropriate appurtenances in the sewerage systems
d. Selection of suitable treatment flow for sewage treatment
e. Identify the critical point of pollution in a river for a specific amount of pollutant disposal into the river

SYLLABUS:

UNIT – I:

Introduction to sanitation – Systems of sanitation – relative merits & demerits – collection and conveyance of waste water – sewerage – classification of sewerage systems- Estimation of sewage flow and storm water drainage – fluctuations – types of sewers – design of sewers – appurtenances in sewerage – cleaning and ventilation of sewers

UNIT – II:

Pumping of wastewater: Pumping stations – location – components– types of pumps and their suitability with regard to wastewaters.

House Plumbing: Systems of plumbing-sanitary fittings and other accessories–one pipe and two pipe systems – Design of building drainage

UNIT – III:

Sewage characteristics – Sampling and analysis of wastewater - Physical, Chemical and Biological Examination-Measurement of BOD and COD - BOD equations

Treatment of sewage: Primary treatment-Screens-grit chambers-grease traps–floatation– sedimentation – design of preliminary and primary treatment units.

UNIT – IV:

Secondary treatment: Aerobic and anaerobic treatment process-comparison.

Suspended growth process: Activated Sludge Process, principles, designs, and operational problems, modifications of Activated Sludge Processes, Oxidation ponds, Aerated Lagoons.
Attached Growth Process: Trickling Filters–mechanism of impurities removal- classification–design-operation and maintenance problems. RBCs, Fluidized bed reactors

UNIT V:
Miscellaneous Treatment Methods: Nitrification and Denitrification – Removal of Phosphates –UASB–Membrane reactors-Integrated fixed film reactors. Anaerobic Processes: Septic Tanks and Imhoff tanks-working Principles and Design–disposal of septic tank effluent, Latest methods of waste water management, ZLD.

UNIT – VI:
Bio-solids (Sludge) management: Characteristics- handling and treatment of sludge-thickening – anaerobic digestion of sludge
Disposal of sewage: Methods of disposal – disposal into water bodies-Oxygen Sag Curve-disposal on land-sewage sickness- Effluent Standards.

Text Books

1. Wastewater Engineering Treatment and Reuse by Metcalf & Eddy, Tata McGraw-Hill edition.
2. Elements of Environmental Engineering by K.N. Duggal, S. Chand & Company Ltd. New Delhi, 2012.
3. Environmental Engineering by Howard S. Peavy, Donald R. Rowe, Teorge George Tchobanoglus – Mc-Graw-Hill Book Company, New Delhi, 1985
4. Municipal and Industrial Wastewater management, KVSG Murali Krishna.

References

1. Environmental Engineering –II: Sewage disposal and Air Pollution Engineering, by Garg, S.K.; Khanna Publishers
2. Sewage treatment and disposal by Dr. P.N. Modi & Sethi.
3. Environmental Engineering by D. Srinivasan, PHI Learning Private Limited, New Delhi, 2011.

III B.Tech- Civil Engineering- II Semester

OPEN ELECTIVE-I (OE3201): Choose one from below Nine courses

		L	T	P	C
		3	0	0	3
a) DISASTER MANAGEMENT					

Course LearningObjectives:

The objective of this courseis:

1. Develop an understanding of why and how the modern disaster manager is involved with pre-disaster and post-disasteractivities.
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 theydiffer.
3. Understand the 'relief system' and the 'disastervictim.'
4. Describe the three planning strategies useful inmitigation.
5. Identify the regulatory controls used in hazardmanagement.
6. Describe public awareness and economic incentivepossibilities.
7. Understand the tools of post-disastermanagement.

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 mitigationwork
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 Indiancoast.

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 theirmanagement.

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., NewDelhi.
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), Universitiespress.
2. 'Disaster Management – Global Challenges and Local Solutions' by Rajib shah & R R Krishnamurthy (2009), Universitiespress.
3. R. Nishith , Singh AK, " Disaster Management in India : Perspectives, Issues and strategies" New Royal BookCompany."

III B.Tech- Civil Engineering- II Semester

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b) ENVIRONMENTAL POLLUTION & CONTROL					

Course LearningObjectives:

The objective of this courseis:

1. Impart knowledge on fundamental aspects of air pollution & control, noise pollution, and solid wastemanagement.
2. Provide basic knowledge on sustainabledevelopment.
3. Introduces some basics of sanitation methods essential for protection of communityhealth.
4. Provide basic knowledge on solid wastemanagement.

Course Learning Outcomes:

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

a. Identify the air pollutant controldevices
b. Have knowledge on the NAAQ standards and air emissionstandards
c. Differentiate the treatment techniques used for sewage and industrial wastewater treatment methods.
d. Understand the fundamentals of solid waste management, practices adopted in his town/village and its importance in keeping the health of thecity.
e. Appreciate the methods of environmental sanitation and the management of community facilities without spread ofepidemics.
f. Appreciate the importance of sustainable development while planning a project or executing an activity.

SYLLABUS:

UNIT – I

Air Pollution: Air pollution Control Methods–Particulate control devices – Methods of Controlling Gaseous Emissions – Air quality standards.

Noise Pollution: Noise standards, Measurement and control methods – Reducing residential and industrial noise – ISO14000.

UNIT –II

Industrial Wastewater Management: – Strategies for pollution control - Volume and Strength reduction – Neutralization – Equalization – Proportioning – Common Effluent Treatment Plants - Recirculation of industrial wastes – Effluent standards.

UNIT – III

Solid Waste Management: Solid waste characteristics – basics of on-site handling and collection – separation and processing – Incineration-Composting-Solid waste disposal methods – fundamentals of Land filling.

UNIT – IV

Environmental Sanitation: Environmental Sanitation Methods for Hostels and Hotels, Hospitals, Swimming pools and public bathing places, social gatherings (melas and fares), Schools and Institutions, Rural Sanitation-low cost waste disposal methods.

UNIT- V

Sustainable Development: Definition- elements of sustainable developments -Indicators of sustainable development- Sustainability Strategies- Barriers to Sustainability–Industrialization and sustainable development – Cleaner production in achieving sustainability- sustainable development.

TEXT BOOKS:

1. Environmental Engineering, by Ruth F. Weiner and Robin Matthews – 4th Edition Elesevier,2003.
3. Environmental Science
4.
5. and Engineering by J.G. Henry and G.W. Heinke – Pearson Education.
3. Environmental Engineering by Mackenzie L Davis & David A Cornwell. McGraw Hill Publishing.

REFERENCES:

1. Air Pollution and Control by M.N. Rao & H.N.Rao
2. Solid Waste Management by K. Sasi Kumar, S.A. Gopi Krishna. PHI NewDelhi.
3. Environmental Engineering by Gerard Kiley, Tata McGrawHill.
4. Industrial Water Pollution Control by Nemerow Jr., McGraw HillPublishing.
5. Unit Operations and Processes in Environmental Engineering by Reynolds. Richard – Cengage Learning.
6. Environmental Engineering by D. Srinivasan, PHI Learning Private Limited, New Delhi, 2011.
7. Environmental Engineering – Howard S. Peavy, Donald R. Rowe, Teorge George Tchobanoglus – Mc-Graw-Hill Book Company, New Delhi, 1985.

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c) ELEMENTS OF CIVIL ENGINEERING					

COURSE OBJECTIVES:

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

1. basics of Civil Engineeringconcepts
2. the surveying, elevations andmapping
3. the construction materials and elements
4. water resource development

COURSEOUTCOMES:

At the end of the course the student is familiar

a) basics of Civil Engineeringconcepts
b) the surveying the elevations andmapping
c) the construction materials andelements
d) water resource developmentand
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 levelling, 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; Local attraction; compass surveying field work.

Elevation measurements:

Levelling, object and uses, terms used in levelling, levelling instruments, methods of levelling, recording and methods of reducing, errors in levelling, contours; characteristics and applications.

Modern Tools of Surveying and Mapping:

Introduction to Theodolite, Electronic Distance Measurement Instruments, Total Station, Global Positioning System, Remote Sensing and Geographic Information System.

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 , Plastic, Conducting, Magnetic, and Miscellaneous Materials

Unit IV:

Elements of Building Construction

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, Water Conveyance System: Canals; Water Conduits.

Books:

1. Surveying Vol 1& ii Dr. B. C. Punmia, Laxmi publication Delhi.
2. Building Construction, Dr B C Punmia, Laxmi publication Delhi.
3. Engineering Material, Dr. S. C. Rangwal, Charotar Pub, House
4. Irrigation engineering and Hydraulic Structures, Santhosh Kumar Garg, : Khanna publishers
5. Civil Engg. Drawing, S. C. Rangwal, Charotar Pub. House Anand
6. Elements of Civil Engineering (IV Edition) by S.S. Bhavikatti, New Age International Publisher, New Delhi, 3rd edition

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d) GREEN TECHNOLOGY					

Course LearningObjectives:

The objective of this courseis:

1. To present different concepts of greentechnologies.
2. To acquire principles of Energy efficienttechnologies.
3. To impart knowledge on the methods of reducing CO_2 levels inatmosphere.
4. To gain knowledge of the importance of life cycleassessment
5. To learn the importance of green fuels and its impact onenvironment.

Course Learning Outcomes

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

- Enlist different concepts of green technologies in aproject
- Understand the principles of Energy efficienttechnologies
- Estimate the carbon credits of variousactivities
- Identify the importance of life cycleassessment
- Recognize the benefits of green fuels with respect to sustainabledevelopment.

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 andapplication.

UNIT- V

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

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

TEXT BOOKS:

1. 'Pollution Prevention: Fundamentals and Practice' by Paul L Bishop (2000), McGraw HillInternational.
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 RaiG.D.

REFERENCES:

1. 'Pollution Prevention and Abatement Handbook – Towards Cleaner Production' by World Bank Group (1998), World Bank and UNEP, WashingtonD.C.
2. 'Handbook of Organic Waste Conversion' by BewikM.W.M.
3. 'Energy, The Solar Hydrogen Alternative' by BokrisJ.O.
4. 'Solar Energy' by SukhatmeS.P.
5. 'Waste Energy Utilization Technology' by Kiang Y.H.

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e) SMART CITIES					

Course Objectives:

The course aims towards

1. developing asensitization
2. skills tounderstand
3. applicability of Inclusive urban planningand
4. improving towards the sustainabledevelopment.

Course Outcome:

After learning the course

The students should be able to:

a) Understand theimportance
b) practicing the concept of inclusive urbanplanning
c) will have sensitization towards implementing contributions in sustainabledevelopment.

SYLLABUS

Unit – IUnderstanding Inclusive Planning:
Definition and components; urban consultations; basic principles of urban consultation, process of urban consultations; urban strategic planning, good urban governance, subsidiarity, equity, efficiency, transparency and accountability, civic engagement and citizenship, security; valuing difference and working with diversity; liveable cities;

Unit – II Stakeholders profile and needs, access to shelter, services and livelihoods:
Urban Poor, Informal Sector, Gender, Children, Elderly, Disabled, Displaced people, etc.; Slums - dimensions, causative factors, determinants, location characteristics of settlements; Informal sector - growth, characteristics, functions, economic contributions, linkages with formal sector, impact on Urban Development

Unit – IIIParticipatory Planning Process and Policies, Programmes and Legislation:
Methods, role of stakeholders (including civil society organizations), etc.; Related Acts, Five year plans, policies and programmes at various levels.

Unit- IVSmart Cities:
Innovation economy (Innovation in industries, clusters, districts of a city; Knowledge workforce: Education and employment; Creation of knowledge-intensive companies); Urban Infrastructure (Transport, Energy/ Utilities, protection of the environment and safety); Governance (Administration services to citizens, participatory and direct democracy, services to the citizen, quality of life)

Unit – VPlanning interventions:
Inclusive zoning, development and building regulations, Slum Improvement; drafting strategic urban development plans – objectives and key actors; planning framework for actions, process of drafting the plan, key considerations; urban design and decision-making; city transport for all; water supply and sanitation, urban disaster management, management through decentralization,

Reference Books:

1. Jo Beall (1997); "A city for all: valuing differences and working with diversity"; Zedbooks limited,London
2. UN-Habitat; "Inclusive and sustainable urban planning: a guide for municipalities"; Volume 3: Urban Development Planning (2007); United Nations Human SettlementsProgramme
3. Arup Mitra; "Insights into inclusive growth, employment and wellbeing in India";Springer (2013), New Delhi
4. William J. V. Neill (2004); "Urban Planning and cultural identity"; Routledge,London
5. John S. Pipkin, Mark E. La Gory, Judith R. Balu (Editors); "Remaking the city: Socialscience perspective on urban design"; State University of New York Press,Albany
6. Giffinger, Rudolf; Christian Fertner; Hans Kramar; Robert Kalasek; Nataša Pichler-Milanovic; Evert Meijers (2007). "Smart cities – Ranking of European medium-sized cities". Smart Cities. Vienna: Centre of RegionalScience
7. "Draft Concept Note on Smart City Scheme". Government of India - Ministry of Urban Development (http://indiansmartcities.in/downloads/CONCEPT_NOTE_3.12.2014REVISED_AND_LATEST_.pdf)

List of Open Source Software/learning website:

- Google books and publications on inclusive urban planning (https://www.google.co.in/search?q=inclusive+urban+planning&btnG=Search+Books&tbm=bks&tbo=1&gws_rd=ssl)
- MoUD, GOI Website(http://indiansmartcities.in/site/index.aspx)

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f) PROJECT MANAGEMENT					

Course LearningObjectives:

The objective of this courseis:

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 andmachinery
3. to introduce the importance of safety in constructionprojects

Course Outcomes:

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

a) appreciate the importance of constructionplanning
b) understand the functioning of various earth movingequipment
c) know the methods of production of aggregate products andconcreting
d) apply the gained knowledge to project management and constructiontechniques

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

UNIT -IV

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

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, TataMcgrawhill
2. 'Construction Project Management Theory and Practice' by Kumar Neeraj Jha (2011), Pearson.
3. 'Construction Technology' by Subir K. Sarkar and Subhajit Saraswati, 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 , Cengagelearning

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		3	**0**	**0**	**3**
g) TRAFFIC SAFETY					

Course Objectives:

1) This module on the fundamentals of traffic engg. & some of the statistical methods to analyse the trafficsafety.
2) The accident interrogations and risk involved with measures to identify the causes aredealt.
3) The role of road safety in planning the urban infrastructures design isdiscussed.
4) Various mitigation measures to prevent the road accidents aredealt.

Course Outcomes: The student is able to

a) To understand fundamentals of TrafficEngg.
b) To investigate and determine the collective factors & remedies of accidentinvolved.
c) To design and plan various roadgeometrics.
d) To manage the traffic system from road safety point ofview.

UNIT I

Fundamentals of Traffic Engineering:

Basic Characteristics of Motor-Vehicle Traffic, Highway Capacity, Applications of Traffic Control Devices, Traffic Design of Parking Facilities, Traffic Engineering Studies; Statistical Methods in Traffic Safety Analysis – Regression Methods, Poisson Distribution, Chi- Squared Distribution, Statistical Comparisons.

UNIT II

Accident Investigations and Risk Management:

Collection and Analysis of Accident Data, Condition and Collision Diagram, Causes and Remedies, Traffic Management Measures and Their Influence on Accident Prevention, Assessment of Road Safety, Methods to Identify and Prioritize Hazardous Locations and Elements, Determine Possible Causes of Crashes, Crash Reduction Capabilities and Countermeasures, Effectiveness of Safety Design Features, Accident Reconstruction.

UNIT III

Road Safety in Planning and Geometric Design:

Vehicle And Human Characteristics, Road Design and Road Equipments, Redesigning Junctions, Cross Section Improvements, Reconstruction and Rehabilitation of Roads, Road Maintenance, Traffic Control, Vehicle Design and Protective Devices, Post Accident Care.

UNIT IV

Role of Urban infrastructure design in safety:

Geometric Design of Roads; Design of Horizontal and Vertical Elements, Junctions, At Grade and Grade Separated Intersections, Road Safety in Urban Transport, Sustainable Modes and their safety.

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, Road safetyaudit.

TEXT BOOKS:

1. Institute of Transportation Engineers (ITE), The Traffic Safety Toolbox: A Primer on Traffic Safety, ITE, 1999.
   Towards Safe Roads in Developing country, TRL – ODA, 2004.
2. Traffic Engineering and Transportation Planning – L.R. Kadiyali, KhannaPublishers
3. Fundamentals of Traffic Engineering, Richardo GSigua

REFERENCES:

1. Athelstan Popkess, Traffic Control and Road Accident Prevention, Chapman and Hall,1997 (Digitized2008)
2. Handbook of Road Safety measures, second Edition, Rune Elvik, Alena Hoye, TrulsVaa, MichaelSorenson
3. Ezra Hauer, Observational Before-After Studies in Road Safety, Pergamon Press, 1997 (reprinted2002).
4. Geetam Tiwari and Dinesh Mohan, Transport Planning and Traffic Safety: Making Cities, Roads, and Vehicles Safer, CRC Press,2016
5. Fundamentals of Transportation Engineering – C.S. Papacostas, Prentice HallIndia.
6. Transportation Engineering – An Introduction, C.Jotinkhisty, B. KentLall
7. Handbook of Road Safety measures, second Edition, Rune Elvik, Alena Hoye, Truls Vaa, MichaelSorenson
8. Road Safety byNCHRP.

UNIVERSITY COLLEGE OF ENGINEERING KAKINADA (AUTONOMOUS)
JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA: KAKINADA
Board of Studies **(B. Tech – Civil Engineering**) Meeting (**R19**)
22nd, 23rd&24thMarch, 2021

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i) WASTEWATER TREATMENT					

Course Learning Objectives:

The course will address the following:

1. Enables the student to distinguish between the quality of domestic and industrialwater requirements and wastewater quantitygeneration.
2. To impart knowledge on selection of treatment methods for industrialwastewater.
3. To know the common methods of treatment in differentindustries
4. To acquire knowledge on operational problems of effluent treatmentplant.

Course Outcomes:

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

a) Know the quality and quantity of water for various industries and Advanced watertreatment methods
b) Learn the common methods of treatment of wastewaters and Biological treatmentmethods
c) Study of methods to reduce impacts of disposal of wasters into environment andCETPs.
d) Study of methods of treatment of wastewaters from specific industries like steel plants, refineries, and power plants, that imply biological treatmentmethods
e) Study of methods of treatment of wastewaters from industries like Aqua, dairy, sugar plants, and distilleries that imply biological treatmentmethods

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 inIndustries.

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.

Text books

1. Industrial Wastewater Treatment by KVSG Murali Krishna, ParamountPublishers, Visakhapatnam,2019
2. Wastewater Treatment by M.N. Rao and A.K. Dutta, Oxford & IBH,NewDelhi.
3. Industrial Wastewater treatment by A.D. Patwardhan, PHILearning,Delhi
4. Wastewater Treatment for Pollution Control and Reuse, by Soli. J Arceivala, ShyamR Asolekar, Mc-Graw Hill, New Delhi;3rdEdition

References

1. Industrial Water Pollution Control by W. Wesley Eckenfelder, Mc- GrawHill, ThirdEdition
2. Wastewater Engineering by Metcalf and EddyInc.,Tata McGrawhillCo., NewDelhi
3. Wastewater Treatment- Concepts and Design Approach by G.L. Karia & R.A. Christian, Prentice Hall ofIndia.
4. Unit Operations and Processes in Environmental Engineering by Reynolds. Richard,Cengage Learning.

III B.Tech- Civil Engineering- II Semester

ENVIRONMENTAL ENGINEERING LAB(PC3205)

Lecture :	--	Internal Assessment :	25Marks
Tutorial :	--	Semester End Examination :	50Marks
Practical :	3 hrs/week	Credits :	2

Learning Objectives:

The course will address the following:

1. Estimation of some important characteristics of water and wastewater in the laboratory
2. It also gives the significance of the characteristics of the water and wastewater

Outcomes:

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

a. Estimate some important characteristics of water and wastewater in the laboratory
b. Draw some conclusion and decide whether the water is suitable for construction or not, drinking or not; ultimate disposal as per effluent standards or not.
c. Decide whether the water body is polluted or not with reference to the state parameters in the list of experiments
d. Estimate and study the strength of the raw and treated effluents in terms of BOD, COD, pH, TDS and chloride of the neutralization tank treating effluents from Chemistry lab or Environmental Engineering Laboratory

SYLLABUS:

List of Experiments

1. Determination of pH and Electrical Conductivity (Salinity) of Water and Soil.
2. Determination and estimation of Total Hardness–Calcium & Magnesium.
3. Determination of Alkalinity/Acidity
4. Determination of Chlorides in water and soil
5. Determination and Estimation of Total Solids, Organic Solids and Inorganic Solids and Settleable Solids by Imhoff Cone.
6. Determination of Iron.
7. Determination of Dissolved Oxygen with D.O. Meter & Wrinklers Method and B.O.D.
8. Determination of N, P, K values in solid waste
9. Physical parameters – Temperature, Colour, Odour, Turbidity, Taste.
10. Determination of C.O.D.
11. Determination of Optimum coagulant dose.
12. Determination of Chlorine demand.
13. Presumptive Coliform test.
14. Visit a Water Treatment Plant and give a technical report.

NOTE: At least 10 of the above experiments are to be conducted.

List of Equipments

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

Text Books

1. Standard Methods for Analysis of Water and Waste Water – APHA
2. Chemical Analysis of Water and Soil by KVSG Murali Krishna, Reem Publications, New Delhi

Reference

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

III B.Tech - II Semester

TRANSPORTATION ENGINEERING LAB (PC3206)

Lecture :	--	Internal Assessment :	25 Marks
Tutorial :	--	Semester End Examination :	50 Marks
Practical :	3 hrs/week	Credits :	2

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.

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.

REFERENCE BOOKS:

1. IRC Codes of Practice
2. Asphalt Institute of America Manuals
3. Code of Practice of B.I.S.

***

III Year – II Semester		**L**	**T**	**P**	**C**
		2	**0**	**0**	**0**
Essence of Indian Traditional Knowledge / Professional Ethics and Human Values (MC3201)					

Essence of Indian **Traditional**
Knowledge Course
Objectives
The course is introduced

- To get a knowledge in IndianPhilosophicalFoundations.
- To Know Indian Languages and Literature and the fine arts in India &TheirPhilosophy.
- To explore the Science and Scientists of Medieval andModernIndia

Course Outcomes
After successful completion of the course the students will be able to

7. Understand philosophy ofIndianculture.
8. Distinguish the Indian languages and literature amongdifferencetraditions.
9. Learn the philosophy of ancient, medieval andmodernIndia.
10. Acquire the information about the fine artsinIndia.
11. Know the contribution of scientists of differenteras.
12. The essence of Yogic Science for Inclusivenessofsociety.

UNIT – I

Introduction to Indian Philosophy: Basics of Indian Philosophy, culture, civilization, culture and heritage, general characteristics of culture, importance of culture in human literature, Indian culture, Ancient Indian, Medieval India, Modern India.

UNIT – II

Indian Philosophy & Literature: Vedas Upanishads, schools of Vedanta, and other religion Philosophical Literature. Philosophical Ideas the role of Sanskrit, significance of scriptures to current society, Indian Philosophies, literature of south India.

Indian languages and Literature-II: Northern Indian languages & Philosophical & cultural & literature.

UNIT –III

Religion and Philosophy: Religion and Philosophy in ancient India, Religion and Philosophy in Medieval India, Religious Reform Movements in Modern India (selected movements only)

UNIT – IV

Indian Fine Arts & Its Philosophy (Art, Technology & Engineering): Indian Painting, Indian handicrafts, Music, divisions of Indian classic music, modern Indian music, Dance and Drama, Indian Architecture (ancient, medieval and modern), Science and Technology in Indian, development of science in ancient, medieval and modern Indian

UNIT – V

Education System in India: Education in ancient, medieval and modern India, aims of education, subjects, languages, Science and Scientists of Ancient India, Scientists of Medieval India, Scientists of Modern India. The role Gurukulas in Education System, Value based Education.

Suggested Readings:

a. Kapil Kapoor, "Text and Interpretation: The India Tradition'', ISBN:81246033375,2005
b. "Science in Samskrit", Samskrita BhartiPublisher,ISBN-13:978-8187276333,2007
c. NCERT, "Position paper on Arts, Music, Dance and Theatre'', ISBN81-7450-494-X,2006
d. S. Narain, "Examination in Ancient India", Arya Book Depot,1993
e. Satya Prakash, "Founders of Sciences in Ancient India", Vijay KumarPublisher,1989
f. M.Hiriyanna, "Essentials of Indian Philosophy", Motilal Banarsidass Publishers,ISBN-13: 978-8120810990,2014
g. Chatterjee. S & Dutta "An Introduction toIndianPhilosophy"

(or)

PROFESSIONAL ETHICS AND HUMAN VALUES

Course Objectives: To give basic insights and inputs to the student to inculcate Human values to grow as a 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/sInvoluntary Risk – Consequences - Risk Assessment – Accountability – Liability - Reversible Effects - Threshold Levels of Risk - Delayed v/sImmediate 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-WhistleBlowing.

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 be dealt where evernecessary.

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:

a. Professional Ethics by R. Subramaniam – Oxford Publications, NewDelhi.
b. Ethics in Engineering by Mike W. Martin and Roland Schinzinger - Tata McGraw-Hill – 2003.

REFERENCE BOOKS:

a. Professional Ethics and Morals by Prof.A.R.Aryasri, DharanikotaSuyodhana - Maruthi Publications.
b. Engineering Ethics by Harris, Pritchard and Rabins, Cengage Learning, NewDelhi.
c. Human Values & Professional Ethics by S. B. Gogate, Vikas Publishing House Pvt. Ltd., Noida.
d. Engineering Ethics & Human Values by M.Govindarajan, S.Natarajan and V.S.SenthilKumar- PHI Learning Pvt. Ltd –2009.
e. Professional Ethics and Human Values by A. Alavudeen, R.Kalil Rahman and M. Jayakumaran – University SciencePress.
f. 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

IV B.Tech - I Semester

WATER RESOURCES ENGINEERING–II (PC4101)

Lecture :	3 hrs/Week	Internal Assessment :	30Marks
Tutorial :	1 Hrs/Week	Semester End Examination :	70Marks
Practical :	--	Credits :	3

Course Learning Objectives:

The course is designed to make the students;

1. Learn the types of irrigation systems
2. Understand the concepts of planning and design of irrigation systems
3. Study the relationships among soil, water and plant and their significance in planning an irrigation system
4. Understand design principles of erodible and non-erodible canals
5. Know the principles of design of weirs on permeable foundations
6. Know the concepts for analysis and design of storage head works
7. Learn design principles of canal structures

Course Outcomes

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

a. Estimate irrigation water requirements
b. Design irrigation canals
c. Design irrigation canal structures
d. Plan and design diversion head works
e. Analyse stability of gravity and earth dams
f. Design hydraulic ogee spillways

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.

UNIT- III

Canal Structures:

Falls: Types and location, design principles of Sarda type fall and straight glacis fall. (Description only)

Regulators: Head and cross regulators, design principles (Description only)

Cross Drainage Works: Types, selection, design principles of aqueduct, siphon aqueduct and super passage. (Description only)

Outlets: Types, proportionality, sensitivity and flexibility

River Training: Objectives and approaches

UNIT-IV

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-V

Reservoir Planning: Investigations, site selection, zones of storage, yield and storage capacity of reservoir, reservoir sedimentation.

Dams: Types of dams, selection of type of dam, selection of site for a dam.

Gravity dams: Forces acting on a gravity dam, causes of failure of a gravity dam, elementary profile and practical profile of a gravity dam, limiting height of a dam, stability analysis.

Earth Dams: Types, causes of failure, criteria for safe design, seepage, measures for control of seepage-filters.

Spillways: Types, design principles of Ogee spillways, types of spillways crest gates.

TEXT BOOKS:

1. 'Irrigation and Water Power 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 and Water Resources Engineering' by Asawa G L (2013), New Age International Publishers
3. 'Irrigation Engineering' by Raghunath H.M (2012), Wiley India.
4. 'Irrigation Water Resources and Water Power Engineering' by Modi P N (2011), Standard Book House, New Delhi

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.

IV B.Tech - I Semester

ESTIMATING, SPECIFICATIONS & CONTRACTS(PE4101)

Lecture :	3 hrs/Week	Internal Assessment :	30Marks
Tutorial :	1 Hrs/Week	Semester End Examination :	70Marks
Practical :	--	Credits :	3

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 contigent 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.

FINAL EXAMINATION PATTERN:

The end examination paper should consist of SIX questions from Unit 1 to Unit 4, out of which THREE are to be answered (60% weight-age) & ONE mandatory question (40% weight-age) from Units 5 & 6 is to be answered.

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

IV B.Tech - I Semester

REMOTE SENSING AND GIS APPLICATIONS (PE4102)

Lecture :	3 hrs/Week	Internal Assessment :	30Marks
Tutorial :	1 Hrs/Week	Semester End Examination :	70Marks
Practical :	--	Credits :	3

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 analyses
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

Sensors and platforms: Introduction, types of sensors, airborne remote sensing, spaceborne 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 preprocessing, 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 General: Land cover and land use, agriculture, forestry, geology, geomorphology, urban & transportation applications,

UNIT - VI

Application to Hydrology and Water Resources: Flood zoning and mapping, groundwater prospects, groundwater quality monitoring and potential recharge zones, watershed management.

TEXT BOOKS:

1. Bhatta B (2008), 'Remote sensing and GIS', Oxford University Press
2. Lillesand, T.M, R.W. Kiefer and J.W. Chipman (2013) 'Remote Sensing and Image Interpretation', Wiley India Pvt. Ltd., New Delhi
3. Schowenger, R. A (2006) 'Remote Sensing' Elsevier publishers.
4. 'Fundamentals of Remote Sensing' by George Joseph, Universities Press, 2013.
5. 'Fundamentals of Geographic Information Systems' by Demers, M.N, Wiley India Pvt. Ltd, 2013.

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 A K W Yeung, Prentice Hall (India), 2006
3. 'Introduction to Geographic Information Systems' by Kand Tsung Chang, McGraw Hill Higher Education, 2009.
4. 'Basics of Remote sensing & GIS' by Kumar S, Laxmi Publications, New Delhi, 2005.
5. 'Principals of Geographical Information Systems' by Burrough P A and R.A. McDonnell, Oxford University Press, 1998.

III B.Tech- Civil Engineering- II Semester		**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**
h) GEO-SPATIAL TECHNOLOGIES					

Course Objectives:

1. Understand the various spatial and non-spatial data types, and data basemanagement
   a. techniques
2. Develop the concepts and professional skills in utility of geospatialtechniques
3. Improve the working knowledge of geospatial techniques in fieldproblems

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 geographiclocations
b) Apply Geospatial techniques in the decision support systems useful for decision makers and communityservices.
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 Geospatialtechniques
e) Apply the concept of Geospatial Techniques to the Civil Engineeringproblems

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 ElevationData.

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.

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.,andMcDonnellR.A.(1998).*PrinciplesofGeographicalInformationSystems.* Oxford University Press, New York.
3. Kang-tsung Chang. (2006). *Introduction to Geographical Information Systems.* Tata McGraw-Hill Publishing Company Ltd., Third Edition, NewDelhi.
4. George Joseph, (2013). *'Fundamentals of Remote Sensing'* UniversitiesPress.

References:

2. Sabins F.F. Jr. (1978). *Remote Sensing Principles and Interpretations.* W.H. Freeman and Company, SanFrancisco.
3. Tor Bernhardsen. (2002). *Geographical Information System.* Wiley India (P) Ltd., Third Edition, NewDelhi.
4. Hoffman-Wellenhof, B, et al. (1997). *GPS Theory and Practice.* Fourth Edition, Springer Wein, New York.
5. Lilysand T.M., and Kiefer R.W. (2002). *Remote Sensing and Image Interpretation*. John Wiley and Sons, Fourth Edition, NewYork.
6. Choudhury S., Chakrabarti, D., and Choudhury S. (2009). *An Introduction to Geographic Information Technology.* I.K. International Publishing House (P) Ltd, NewDelhi.

MSFI-3-a) GROUND IMPROVEMENT TECHNIQUES (ELECTIVE-IV)

Common for M.Tech.

(Soil Mechanics & Foundation Engineering and Geotechnical Engineering)

Pre-Requisites: Soil Mechanics

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

CO1	Understand the principles of various ground improvement techniques
CO2	Prefer suitable ground improvement techniques based on the Soil conditions and local available Materials
CO3	Understand the principles and suitability of various stabilization techniques
CO4	Select suitable stabilization techniques based on the Soil conditions and local available materials
CO5	Understand the Principles of dewatering techniques and to apply suitable dewatering technique in the field depending on the requirement
CO6	Understand the grouting technology and its applications by selecting the suitable grout based on the field conditions

Mapping of Course Outcomes with Outcomes:

Course Out Comes	PO1	PO2	PO3	PO4	PO5
CO1	1	--	3	1	--
CO2	1	--	3	1	2
CO3	--	1	3	1	2
CO4	1	--	3	1	2
CO5	--	--	3	1	1
CO6	--	--	3	1	--

1. **Slightly 2. Moderately 3.Substantially**

Detailed Syllabus:

Unit: 1

Introduction – Need for Engineering Ground – Classifications of Ground Modification Techniques – Suitability, Feasibility and Desirability.Densification of cohesionless soils – Deep Compaction – Vibro flobation – Vibro Composer method - Blasting – Densification at Ground. - Vibro compaction - Heavy Tamping

Unit: 2

Improvement of Cohesive soils – Preloading - Soil Replacement – Radial Consolidation – Vertical and Radial Consolidation - Vertical Drains – Sand Drains – Effect of Smear – Sandwicks – Band drains – Dynamic Compaction.

Unit: 3

Stabilisation- Mechanical Stabilisation, Lime Stabilisation, Cement Stabilisation, Bitumen Stabilisation, Thermal Stabilisation, Chemical Stabilistion and Stabilisation with Different Admixtures

Unit: 4

Dewatering : - Dewatering methods – open sumps and ditches – gravity flow wells – Vacuum dewatering – Electro – kinetic dewatering – Electrosmosis
Grouting: Overview of grouting - Suspension grouts – Solution grouts – Emulsion grouts-Categories of grouting – Grouting Techniques – ascending stage, descending stage and stage grouting – Grouting Plant - Grout control - Grouting applications – Dams, Tunnels, Shafts and drifts, excavations.

Unit: 5
Stone Columns – Methods of installation of Stone Columns – Load shared by stone columns and the stabilized ground – uses of stone columns Lime columns and granular trenches – Installation – In situ ground reinforcement – ground anchors – types – Components and applications – uplift capability-Stability of foundation trenches and surrounding structures through soil Nailing, tie backs.

REFERENCE:

1. Construction and Geotechnical Methods in Foundation Engineering By R.M. Koerner, McGraw – Hill Book Co.
2. Current Practices in Geotechnical Engineering Vol.1, Alam Singh and Joshi, International Book Traders, Delhi, & Geo-Environ Academia.
3. Foundation Analysis and Design (1V Ed.) By J.E. Bowles, McGraw – Hill Book Co.,
4. Ground Improvement Techniques by P. Purushotham Raj, Laxmi Publications (P) Ltd., New Delhi.
5. Ground Improvement – Edited by M.P. Moseley, Blackie Academic & Professional.
6. Soil Mechanics for Road Engineers, H.M.S.O, Londan.
. Ground Improvement Techniques by Bergado et al.

III Year – II Semester		**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**
PROGRAM ELECTIVE – I (PE3201) d). Reinforced Soil Structures					

Course objectives:

1. To understand the history and mechanism of reinforcedsoil
2. To know the various types of geo-synthetics, their functions andapplications.
3. To enable the design of reinforced soil retainingstructures.

Expected Outcomes:

The students will

a) Understand the history and mechanism of reinforcedsoil
b) Become aware about situations where geo-synthetics can beused.
c) Know about various types of geo-synthetics and theirfunctions
d) Be able to do dimple design of reinforced soil retaining walls and reinforced earthbeds.

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 behaviour 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 Geosynthetics, 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.

3. Sivakumar Babu, G.L. (2006). An introduction to Soil reinforcement and geosynthetics. United Press (India) Pvt. Ltd.COURSE

IV Year – II Semester		**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**
PROGRAM ELECTIVE – V (PE4201) a). Design & Drawing of Irrigation Structures					

Course Learning Objectives:

To understand design principle of various irrigation structures

Course Outcomes**:**

At the end of the course the student will be able to To design various irrigation structures.

SYLLABUS:

Design and drawing of

1. Surplusweir
2. Tank sluice with atowerhead
3. Canaldrop-Notchtype
4. Canalregulator
5. Undertunnel
6. Syphon aqueduct type III

Final Examination pattern: Any two question of the above six 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:

1. Irrigation Engineering and Hydraulic Structures, S. K. Garg, StandardBookHouse.
2. Irrigation and Water Power Engineering, B. C Punmia& Lal,Lakshmi Publications Pvt. Ltd.,NewDelhi.

III Year – II Semester		**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**
PROGRAM ELECTIVE – V (PE3201) b). WATERSHED MANAGEMENT					

Course Learning
Objectives:

The course is designed to:

- Introduce the concept of watershed management
- Understand the watershedcharacteristics
- Learn the principles of soil erosion and measures to controlerosion
- Appreciate various water harvestingtechniques.
- Learn land management practices for various land use/landcover.
- Introduce concepts of watershedmodelling.

Course outcomes

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

- Calculate watershed parameters and analyse watershed characteristics to takeappropriate managementaction.
- Quantify soil erosion and design controlmeasures.
- Apply land grading techniques for proper land management.
- Suggest suitable harvesting techniques for better watershedmanagement.
- Apply appropriate models for watershedmanagement.

SYLLABUS

UNIT-I: Introduction: Concept of watershed development, objectives of watershed development, need for watershed development, Characteristics of Watersheds: Size, shape, physiography, slope, climate, drainage, land use, vegetation, geology and soils, hydrology and hydrogeology, socio-economiccharacteristics.

UNIT-II : Principles of Erosion: Types and causes of erosion, factors affecting erosion, estimation of soil loss due to erosion- Universal soil loss equation. Measures to Control Erosion: Contour techniques, ploughing, furrowing, trenching, bunding, terracing, gully control, check dams, rock-fill dams, brushwood dam, Gabion.

UNIT-III: Water Harvesting: Techniques of rain water harvesting- rain water harvesting from roof top, surface flow harvesting, subsurface flow harvesting, stop dams, farm ponds and dugout ponds, percolationtanks.

UNIT-IV: Land Management: Land use and Land capability classification, management of forest, agricultural, grassland and wild land, land grading operation, Reclamation of saline and alkaline soils.

UNIT-V: Watershed Modelling: Data of watershed for modelling, application and comparison of watershed models, model calibration and validation, advances of watershed models. Integrated and multidisciplinary approach for watershed management.

TEXT BOOKS

1. 'Watershed Management' by Das MM and M.D Saikia, PHI Learning Pvt. Ltd,2013.
2. 'Land and Water Management' by Murthy.VVN, Kalyani Publications,2007.
3. 'Watershed Management' by Murthy J V S, New Age International Publishers,2006.

REFERENCES

1. 'Water Resource Engineering'by Wurbs R A and James R A, Prentice Hall Publishers,2002.
2. 'Watershed Hydrology' by Black P E, Prentice Hall,1996.

IV Year – II Semester		**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**
PROGRAM ELECTIVE – V b). Road Safety Engineering					

Course Objectives:

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

Course Outcomes:

The student is able to

a) To understand fundamental of TrafficEngg.
b) To investigate & determine the collective factors & remedies of accidentinvolved.
c) To design & planning various roadgeometrics.
d) To massage the traffic system from road safety point ofview.

SYLLABUS

UNIT I

Introduction to 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, CaseStudies.

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, CaseStudies.

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 safetylaw.

TEXT BOOKS:

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

REFERENCES:

1. Athelstan Popkess, Traffic Control and Road Accident Prevention, Chapman and Hall, 1997 (Digitized2008)
2. Ezra Hauer, Observational Before-After Studies in Road Safety, Pergamon Press, 1997 (reprinted2002).
3. Geetam Tiwari and Dinesh Mohan, Transport Planning and Traffic Safety: Making Cities, Roads, and Vehicles Safer, CRC Press,2016.

IV Year – II Semester		**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**
PROGRAM ELECTIVE – V c). Disaster Management & Mitigation					

Course Objectives:

The objectives of the course are

1. To Understand basic concepts in DisasterManagement
2. To Understand Definitions and Terminologies used in DisasterManagement
3. To Understand Types and Categories ofDisasters
4. To Understand the Challenges posed byDisasters
5. To understand Impacts of Disasters KeySkills

Course Outcomes:

The student will develop competencies in

a) the application of Disaster Concepts toManagement
b) Analyzing Relationship between Development and Disasters.
c) Ability to understand Categories of Disastersand
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, ecologicalfragility.

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 urbandisasters.

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 programmes 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, landuse changes, urbanization etc.), sustainable and environmental friendly recovery; reconstruction and development methods.

Text Books:

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

Reference Books:

1. http://ndma.gov.in/ (Home page of National Disaster ManagementAuthority)
2. http://www.ndmindia.nic.in/ (National Disaster management in India, Ministry ofHome Affairs).
3. Disaster Medical Systems Guidelines. Emergency Medical Services Authority, Stateof California, EMSA no.214, June2003
4. Inter Agency Standing Committee (IASC) (Feb. 2007). IASC Guidelines onMental Health and Psychosocial Support in Emergency Settings. Geneva:IASC

OPEN ELECTIVE-II: Choose one from below Nine courses which is not studied previously

		L	T	P	C
		3	0	0	3
a) DISASTER MANAGEMENT					

Course LearningObjectives:

The objective of this courseis:

8. Develop an understanding of why and how the modern disaster manager is involved with pre-disaster and post-disasteractivities.
9. 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 theydiffer.
10. Understand the 'relief system' and the 'disastervictim.'
11. Describe the three planning strategies useful inmitigation.
12. Identify the regulatory controls used in hazardmanagement.
13. Describe public awareness and economic incentivepossibilities.
14. Understand the tools of post-disastermanagement.

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 mitigationwork
b. Distinguish between the different approaches needed to manage pre- during and post- disaster periods
c. Explain the process of riskmanagement
d. Relate to risktransfer

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 Indiancoast.

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 theirmanagement.

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:

5. An Introduction of Disaster Management- Natural Disasters & Vulnerable Hazards– S.Vaidyanathan: CBS Punblishers & Distributors Pvt.Ltd.
6. Natural Hazards & Disaster Management, Vulnerability and Mitigation by RB Singh- Rawat Publications
7. ‘Disaster Science & Management’ by Tushar Bhattacharya, Tata McGraw Hill Education Pvt. Ltd., NewDelhi.
8. ‘Disaster Management – Future Challenges and Opportunities’ by Jagbir Singh (2007), I K International Publishing House Pvt.Ltd.

REFERENCE BOOKS:

4. ‘Disaster Management’ edited by H K Gupta (2003), Universitiespress.
5. ‘Disaster Management – Global Challenges and Local Solutions’ by Rajib shah & R R Krishnamurthy (2009), Universitiespress.
6. R. Nishith , Singh AK, “ Disaster Management in India : Perspectives, Issues and strategies” New Royal BookCompany.”

		L	T	P	C
		3	0	0	3

b) ENVIRONMENTAL POLLUTION & CONTROL

Course LearningObjectives:

The objective of this courseis:

1. Impart knowledge on fundamental aspects of air pollution & control, noise pollution, and solid wastemanagement.
2. Provide basic knowledge on sustainabledevelopment.
3. Introduces some basics of sanitation methods essential for protection of communityhealth.
4. Provide basic knowledge on solid wastemanagement.

Course Learning Outcomes:

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

a. Identify the air pollutant controldevices
b. Have knowledge on the NAAQ standards and air emissionstandards
c. Differentiate the treatment techniques used for sewage and industrial wastewater treatment methods.
d. Understand the fundamentals of solid waste management, practices adopted in his town/village and its importance in keeping the health of thecity.
e. Appreciate the methods of environmental sanitation and the management of community facilities without spread ofepidemics.
f. Appreciate the importance of sustainable development while planning a project or executing an activity.

SYLLABUS:

UNIT – I

Air Pollution: Air pollution Control Methods–Particulate control devices – Methods of Controlling Gaseous Emissions – Air quality standards.

Noise Pollution: Noise standards, Measurement and control methods – Reducing residential and industrial noise – ISO14000.

UNIT –II

Industrial Wastewater Management: – Strategies for pollution control - Volume and Strength reduction – Neutralization – Equalization – Proportioning – Common Effluent Treatment Plants - Recirculation of industrial wastes – Effluent standards.

UNIT – III

Solid Waste Management: Solid waste characteristics – basics of on-site handling and collection – separation and processing – Incineration-Composting-Solid waste disposal methods – fundamentals of Land filling.

UNIT – IV

Environmental Sanitation: Environmental Sanitation Methods for Hostels and Hotels, Hospitals, Swimming pools and public bathing places, social gatherings (melas and fares), Schools and Institutions, Rural Sanitation-low cost waste disposal methods.

UNIT- V

Sustainable Development: Definition- elements of sustainable developments -Indicators of sustainable development- Sustainability Strategies- Barriers to Sustainability–Industrialization and sustainable development – Cleaner production in achieving sustainability- sustainable development.

TEXT BOOKS:

1. Environmental Engineering, by Ruth F. Weiner and Robin Matthews – 4th Edition Elesevier,2003.
3. Environmental Science
4.
5. and Engineering by J.G. Henry and G.W. Heinke – Pearson Education.
3. Environmental Engineering by Mackenzie L Davis & David A Cornwell. McGraw Hill Publishing.

REFERENCES:

8. Air Pollution and Control by M.N. Rao & H.N.Rao
9. Solid Waste Management by K. Sasi Kumar, S.A. Gopi Krishna. PHI NewDelhi.
10. Environmental Engineering by Gerard Kiley, Tata McGrawHill.
11. Industrial Water Pollution Control by Nemerow Jr., McGraw HillPublishing.
12. Unit Operations and Processes in Environmental Engineering by Reynolds. Richard – Cengage Learning.
13. Environmental Engineering by D. Srinivasan, PHI Learning Private Limited, New Delhi, 2011.
14. Environmental Engineering – Howard S. Peavy, Donald R. Rowe, Teorge George Tchobanoglus – Mc-Graw-Hill Book Company, New Delhi, 1985.

		L	T	P	C
		3	0	0	3
c) ELEMENTS OF CIVIL ENGINEERING					

COURSE OBJECTIVES:

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

5. basics of Civil Engineeringconcepts
6. the surveying, elevations andmapping
7. the construction materials and elements
8. water resource development

COURSEOUTCOMES:

At the end of the course the student is familiar

f) basics of Civil Engineeringconcepts
g) the surveying the elevations andmapping
h) the construction materials andelements
i) water resource developmentand
j) 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 levelling, 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; Local attraction; compass surveying field work.

Elevation measurements:

Levelling, object and uses, terms used in levelling, levelling instruments, methods of levelling, recording and methods of reducing, errors in levelling, contours; characteristics and applications.

Modern Tools of Surveying and Mapping:

Introduction to Theodolite, Electronic Distance Measurement Instruments, Total Station, Global Positioning System, Remote Sensing and Geographic Information System.

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 , Plastic, Conducting, Magnetic, and Miscellaneous Materials

Unit IV:

Elements of Building Construction

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, Water Conveyance System: Canals; Water Conduits.

Books:

7. Surveying Vol 1& ii Dr. B. C. Punmia, Laxmi publication Delhi.
8. Building Construction, Dr B C Punmia, Laxmi publication Delhi.
9. Engineering Material, Dr. S. C. Rangwal, Charotar Pub, House
10. Irrigation engineering and Hydraulic Structures, Santhosh Kumar Garg, : Khanna publishers
11. Civil Engg. Drawing, S. C. Rangwal, Charotar Pub. House Anand
12. Elements of Civil Engineering (IV Edition) by S.S. Bhavikatti, New Age International Publisher, New Delhi, 3rd edition

		L	T	P	C
		3	0	0	3
d) GREEN TECHNOLOGY					

Course LearningObjectives:

The objective of this courseis:

6. To present different concepts of greentechnologies.
7. To acquire principles of Energy efficienttechnologies.
8. To impart knowledge on the methods of reducing CO_2 levels inatmosphere.
9. To gain knowledge of the importance of life cycleassessment
10. To learn the importance of green fuels and its impact onenvironment.

Course Learning Outcomes

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

- Enlist different concepts of green technologies in aproject
- Understand the principles of Energy efficienttechnologies
- Estimate the carbon credits of variousactivities
- Identify the importance of life cycleassessment
- Recognize the benefits of green fuels with respect to sustainabledevelopment.

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 andapplication.

UNIT- V

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

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

TEXT BOOKS:

4. 'Pollution Prevention: Fundamentals and Practice' by Paul L Bishop (2000), McGraw HillInternational.

5. 'Cleaner Production Audit' by Prasad Modak, C.Visvanathan and Mandar Parasnis (1995), Environmental System Reviews, No.38, Asian Institute of Technology,Bangkok
6. 'Non-conventional Energy Sources' by RaiG.D.

REFERENCES:

6. 'Pollution Prevention and Abatement Handbook – Towards Cleaner Production' by World Bank Group (1998), World Bank and UNEP, WashingtonD.C.
7. 'Handbook of Organic Waste Conversion' by BewikM.W.M.
8. 'Energy, The Solar Hydrogen Alternative' by BokrisJ.O.
9. 'Solar Energy' by SukhatmeS.P.
10. 'Waste Energy Utilization Technology' by Kiang Y.H.

		L	T	P	C
		3	0	0	3
e) SMART CITIES					

Course Objectives:

The course aims towards

5. developing asensitization
6. skills tounderstand
7. applicability of Inclusive urban planningand
8. improving towards the sustainabledevelopment.

Course Outcome:

After learning the course

The students should be able to:

d) Understand theimportance
e) practicing the concept of inclusive urbanplanning
f) will have sensitization towards implementing contributions in sustainabledevelopment.

SYLLABUS

Unit – IUnderstanding Inclusive Planning:
Definition and components; urban consultations; basic principles of urban consultation, process of urban consultations; urban strategic planning, good urban governance, subsidiarity, equity, efficiency, transparency and accountability, civic engagement and citizenship, security; valuing difference and working with diversity; liveable cities;

Unit – II Stakeholders profile and needs, access to shelter, services and livelihoods:
Urban Poor, Informal Sector, Gender, Children, Elderly, Disabled, Displaced people, etc.; Slums - dimensions, causative factors, determinants, location characteristics of settlements; Informal sector - growth, characteristics, functions, economic contributions, linkages with formal sector, impact on Urban Development

Unit – IIIParticipatory Planning Process and Policies, Programmes and Legislation:
Methods, role of stakeholders (including civil society organizations), etc.; Related Acts, Five year plans, policies and programmes at various levels.

Unit- IVSmart Cities:
Innovation economy (Innovation in industries, clusters, districts of a city; Knowledge workforce: Education and employment; Creation of knowledge-intensive companies); Urban Infrastructure (Transport, Energy/ Utilities, protection of the environment and safety); Governance (Administration services to citizens, participatory and direct democracy, services to the citizen, quality of life)

Unit – VPlanning interventions:
Inclusive zoning, development and building regulations, Slum Improvement; drafting strategic urban development plans – objectives and key actors; planning framework for actions, process of drafting the plan, key considerations; urban design and decision-making; city transport for all; water supply and sanitation, urban disaster management, management through decentralization,

Reference Books:

8. Jo Beall (1997); "A city for all: valuing differences and working with diversity"; Zedbooks limited,London
9. UN-Habitat; "Inclusive and sustainable urban planning: a guide for municipalities"; Volume 3: Urban Development Planning (2007); United Nations Human SettlementsProgramme
10. Arup Mitra; "Insights into inclusive growth, employment and wellbeing in India";Springer (2013), New Delhi
11. William J. V. Neill (2004); "Urban Planning and cultural identity"; Routledge,London
12. John S. Pipkin, Mark E. La Gory, Judith R. Balu (Editors); "Remaking the city: Socialscience perspective on urban design"; State University of New York Press,Albany
13. Giffinger, Rudolf; Christian Fertner; Hans Kramar; Robert Kalasek; Nataša Pichler-Milanovic; Evert Meijers (2007). "Smart cities – Ranking of European medium-sized cities". Smart Cities. Vienna: Centre of RegionalScience
14. "Draft Concept Note on Smart City Scheme". Government of India - Ministry of Urban Development (http://indiansmartcities.in/downloads/CONCEPT_NOTE_3.12.2014REVISED_AND_LATEST_.pdf)

List of Open Source Software/learning website:

- Google books and publications on inclusive urban planning (https://www.google.co.in/search?q=inclusive+urban+planning&btnG=Search+Books&tbm=bks&tbo=1&gws_rd=ssl)
- MoUD, GOI Website(http://indiansmartcities.in/site/index.aspx)

		L	T	P	C
		3	0	0	3
f) PROJECT MANAGEMENT					

Course LearningObjectives:

The objective of this courseis:

4. To introduce to the student, the concept of project management including network drawing and monitoring
5. to introduce the various equipment related to construction like earth moving equipment, trucks and handling equipment, aggregate production and construction equipment andmachinery
6. to introduce the importance of safety in constructionprojects

Course Outcomes:

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

e) appreciate the importance of constructionplanning
f) understand the functioning of various earth movingequipment
g) know the methods of production of aggregate products andconcreting
h) apply the gained knowledge to project management and constructiontechniques

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

UNIT -IV

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

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:

4. 'Construction Planning, Equipment and Methods' by Peurifoy and Schexnayder , Shapira, TataMcgrawhill
5. 'Construction Project Management Theory and Practice' by Kumar Neeraj Jha (2011), Pearson.
6. 'Construction Technology' by Subir K. Sarkar and Subhajit Saraswati, Oxford University press

REFERENCES:

3. 'Construction Project Management - An Integrated Approach' by Peter Fewings , Taylor and Francis
4. 'Construction Management Emerging Trends and Technologies' by Trefor Williams , Cengagelearning

		L	T	P	C
		3	0	0	3
g) TRAFFIC SAFETY					

Course Objectives:

5) This module on the fundamentals of traffic engg. & some of the statistical methods to analyse the trafficsafety.
6) The accident interrogations and risk involved with measures to identify the causes aredealt.
7) The role of road safety in planning the urban infrastructures design isdiscussed.
8) Various mitigation measures to prevent the road accidents aredealt.

Course Outcomes: The student is able to

a) To understand fundamentals of TrafficEngg.
b) To investigate and determine the collective factors & remedies of accidentinvolved.
c) To design and plan various roadgeometrics.
d) To manage the traffic system from road safety point ofview.

UNIT I

Fundamentals of Traffic Engineering:

Basic Characteristics of Motor-Vehicle Traffic, Highway Capacity, Applications of Traffic Control Devices, Traffic Design of Parking Facilities, Traffic Engineering Studies; Statistical Methods in Traffic Safety Analysis – Regression Methods, Poisson Distribution, Chi- Squared Distribution, Statistical Comparisons.

UNIT II

Accident Investigations and Risk Management:

Collection and Analysis of Accident Data, Condition and Collision Diagram, Causes and Remedies, Traffic Management Measures and Their Influence on Accident Prevention, Assessment of Road Safety, Methods to Identify and Prioritize Hazardous Locations and Elements, Determine Possible Causes of Crashes, Crash Reduction Capabilities and Countermeasures, Effectiveness of Safety Design Features, Accident Reconstruction.

UNIT III

Road Safety in Planning and Geometric Design:

Vehicle And Human Characteristics, Road Design and Road Equipments, Redesigning Junctions, Cross Section Improvements, Reconstruction and Rehabilitation of Roads, Road Maintenance, Traffic Control, Vehicle Design and Protective Devices, Post Accident Care.

UNIT IV

Role of Urban infrastructure design in safety:

Geometric Design of Roads; Design of Horizontal and Vertical Elements, Junctions, At Grade and Grade Separated Intersections, Road Safety in Urban Transport, Sustainable Modes and their safety.

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, Road safetyaudit.

TEXT BOOKS:

1. Institute of Transportation Engineers (ITE), The Traffic Safety Toolbox: A Primer on Traffic Safety, ITE, 1999.
   Towards Safe Roads in Developing country, TRL – ODA, 2004.
2. Traffic Engineering and Transportation Planning – L.R. Kadiyali, KhannaPublishers
3. Fundamentals of Traffic Engineering, Richardo GSigua

REFERENCES:

9. Athelstan Popkess, Traffic Control and Road Accident Prevention, Chapman and Hall,1997 (Digitized2008)
10. Handbook of Road Safety measures, second Edition, Rune Elvik, Alena Hoye, TrulsVaa, MichaelSorenson
11. Ezra Hauer, Observational Before-After Studies in Road Safety, Pergamon Press, 1997 (reprinted2002).
12. Geetam Tiwari and Dinesh Mohan, Transport Planning and Traffic Safety: Making Cities, Roads, and Vehicles Safer, CRC Press,2016
13. Fundamentals of Transportation Engineering – C.S. Papacostas, Prentice HallIndia.
14. Transportation Engineering – An Introduction, C.Jotinkhisty, B. KentLall
15. Handbook of Road Safety measures, second Edition, Rune Elvik, Alena Hoye, Truls Vaa, MichaelSorenson
16. Road Safety byNCHRP.

		L	T	P	C
		3	0	0	3
h) GEO-SPATIAL TECHNOLOGIES					

Course Objectives:

4. Understand the various spatial and non-spatial data types, and data basemanagement
    a. techniques
5. Develop the concepts and professional skills in utility of geospatialtechniques
6. Improve the working knowledge of geospatial techniques in fieldproblems

Course Outcomes:

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

f) Understand the geospatial technology relating to the data acquiring and processing that is associated with geographiclocations
g) Apply Geospatial techniques in the decision support systems useful for decision makers and communityservices.
h) Ability to solve the problems related to the natural resource management, environment, urban planning and Infrastructure development,etc.
i) Able to generate the thematic maps using Geospatialtechniques
j) Apply the concept of Geospatial Techniques to the Civil Engineeringproblems

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 ElevationData.

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.

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:

5. Demers, M.N, (2013). *'Fundamentals of Geographic Information Systems'* Wiley India Pvt.Ltd,.
6. Burrough,P.A.,andMcDonnellR.A.(1998).*PrinciplesofGeographicalInformationSystems.* Oxford University Press, New York.
7. Kang-tsung Chang. (2006). *Introduction to Geographical Information Systems.* Tata McGraw-Hill Publishing Company Ltd., Third Edition, NewDelhi.
8. George Joseph, (2013). *'Fundamentals of Remote Sensing'* UniversitiesPress.

References:

7. Sabins F.F. Jr. (1978). *Remote Sensing Principles and Interpretations.* W.H. Freeman and Company, SanFrancisco.
8. Tor Bernhardsen. (2002). *Geographical Information System.* Wiley India (P) Ltd., Third Edition, NewDelhi.
9. Hoffman-Wellenhof, B, et al. (1997). *GPS Theory and Practice.* Fourth Edition, Springer Wein, New York.
10. Lilysand T.M., and Kiefer R.W. (2002). *Remote Sensing and Image Interpretation*. John Wiley and Sons, Fourth Edition, NewYork.
11. Choudhury S., Chakrabarti, D., and Choudhury S. (2009). *An Introduction to Geographic Information Technology.* I.K. International Publishing House (P) Ltd, NewDelhi.

		L	T	P	C
		3	0	0	3
i) WASTE WATER TREATMENT					

Course Learning Objectives:

The course will address the following:

1. Enables the student to distinguish between the quality of domestic and industrialwater requirements and wastewater quantitygeneration.
2. To impart knowledge on selection of treatment methods for industrialwastewater.
3. To know the common methods of treatment in differentindustries
4. To acquire knowledge on operational problems of effluent treatmentplant.

Course Outcomes:

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

f) Know the quality and quantity of water for various industries and Advanced watertreatment methods
g) Learn the common methods of treatment of wastewaters and Biological treatmentmethods
h) Study of methods to reduce impacts of disposal of wasters into environment andCETPs.
i) Study of methods of treatment of wastewaters from specific industries like steel plants, refineries, and power plants, that imply biological treatmentmethods
j) Study of methods of treatment of wastewaters from industries like Aqua, dairy, sugar plants, and distilleries that imply biological treatmentmethods

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 inIndustries.

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.

Text books

5. Industrial Wastewater Treatment by KVSG Murali Krishna, ParamountPublishers, Visakhapatnam,2019
6. Wastewater Treatment by M.N. Rao and A.K. Dutta, Oxford & IBH,NewDelhi.
7. Industrial Wastewater treatment by A.D. Patwardhan, PHILearning,Delhi
8. Wastewater Treatment for Pollution Control and Reuse, by Soli. J Arceivala, ShyamR Asolekar, Mc-Graw Hill, New Delhi;3rdEdition

References

5. Industrial Water Pollution Control by W. Wesley Eckenfelder, Mc- GrawHill, ThirdEdition
6. Wastewater Engineering by Metcalf and EddyInc.,Tata McGrawhillCo., NewDelhi
7. Wastewater Treatment- Concepts and Design Approach by G.L. Karia & R.A. Christian, Prentice Hall ofIndia.
8. Unit Operations and Processes in Environmental Engineering by Reynolds. Richard,Cengage Learning.

08-GIS & CAD LAB

Lecture :	--	Internal Assessment :	25 Marks
Tutorial :	--	Semester End Examination :	50 Marks
Practical :	3 hrs/Week	Credits :	2

Learning Objectives:

The course is designed to

1. Introduce image processing and GIS software
2. Familiarize structural analysis software
3. Understand the process of digitization, creation of thematic map from toposheets and maps
4. Learn to apply GIS software to simple problems in water resources and transportation engineering
5. Learn to analyze 2 D and 3D frame steel tubular truss using structural analysis software
6. Learn to analyze and design retaining wall and simple towers

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. Use structural analysis software to analyze and design 2D and 3D frames
e. Design and analyze retaining wall and simple towers using CADD software.

SYLLABUS:

GIS:

SOFTWARES:

1. Arc GIS 10.1
2. ERDAS 8.7
3. Mapinfo 6.5
4. ILWIS or Any one or Equivalent.

EXCERCISES IN GIS:

1. Digitization of Map/Toposheet
2. Creation of thematic maps.
3. Estimation of features and interpretation
4. Developing Digital Elevation model
5. Simple applications of GIS in water Resources Engineering & Transportation Engineering.

COMPUTER AIDED DESIGN AND DRAWING:

SOFTWARES:

1. STAAD PRO / Equivalent/
2. STRAAP
3. STUDDS

EXCERCISIES:

1. 2-D Frame Analysis and Design
2. Steel Tabular Truss Analysis and Design
3. 3-D Frame Analysis and Design
4. Retaining Wall Analysis and Design
5. Simple Tower Analysis and Design

TEXT BOOK:

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

IV Year – I Semester		**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**
Design & Drawing of Steel Structures					

Course Learning Objectives:

The objective of this course is to:

- Familiarize Students with different types of Connections and relevantIScodes
- Equip student with concepts of design offlexuralmembers
- Understand Design of tension and compression membersintrusses
- Familiarize students with types of Columns, column bases and theirDesign
- Familiarize students with Plate girder and Gantry Girder andtheirDesign

Course Outcomes**:**

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

- Work with relevantIScodes
- Carryout analysis and design of flexural membersanddetailing
- Design compression members of different types withconnectiondetailing
- Design Plate Girder and Gantry Girder with connectiondetailing
- Produce the drawings pertaining to different components ofsteelstructures

UNIT – I Types of structural steel – Mechanical properties of steel – Concepts of plasticity – yield strength - Loads and Stresses – Local buckling behavior of steel. Concepts of limit State Design – Different Limit States
– Load combinations for different Limit states - Design Strengths- deflection limits – serviceability – stability check.;
Connections: Design of Connections– Different types of connections – Bolted connections –Design strength
– efficiency ofjoint
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 thejoints.

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.

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 of Column 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, OxfordUniversityPress.
2. Limit State Design of steel structures, S. K. Duggal, Tata Mc Graw Hill,NewDelhi

REFERENCES

1. Structural Design in Steel, SarwarAlamRaz, New Age International Publishers,NewDelhi
2. Structural Design and Drawing byN.Krishna Raju, UniversitiesPress
3. Design of Steel Structures by K.S.Sai Ram, Person India EducationServices

IS Codes:

rd

1) IS800:2007,IndianStandardCodeforGeneralConstructioninSteel,3revision,Indian Standards Institution, NewDelhi, 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) SteelTables.

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

IV Year – I Semester		**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**
DESIGN AND DRAWING OF REINFORCED CONCRETE STRUCTURES					

Course LearningObjectives:

The objective of this courseis:

- Familiarize Students with differentdesignphilosophies
- Equip student with design of members in flexural andshear
- Understand bondandtorsion
- Familiarize with design of compression members under different types ofloading
- Understand different types of footingsanddesign

Course Outcomes**:**

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

- Work on different types of designmethods
- Carryout analysis and design of flexural membersanddetailing
- Design structures subjected to shear, bond andtorsion
- Design different type of compression members andfootings

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 DesignProblems.

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.

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 andcontinuousbeams.
2. Reinforcement detailing of columns andisolatedfootings.
3. Detailing of one-way, two-way and continuous slabs and waist-slabstaircase.

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 ChandBrothers
2. Reinforced Concrete Structures, N. Krishna Raju & R. N. Pranesh, New AgePublications.
3. Structural Design and Drawing byN.Krishna Raju, UniversitiesPress

References:

1. R C C Design, B.C Punmia, A. K. Jain and A. K Jain.LakshmiPublications
2. Reinforced Concrete Structures, S. Unnikrishna Pillai &Devdas Menon, Tata c.Graw Hill, New Delhi.
3. Design of Reinforced concrete Structures, N.Subrahmanian, Oxford UniversityPress.

Limit state design of reinforced concrete structures by P C Varghese, PHI Learning pvt.Ltd.

CE805 -DESIGN AND DRAWING OF IRRIGATION STRUCTURES

Lecture :	3 hrs/Week	Internal Assessment :	30Marks
Tutorial :	1 Hrs/Week	Semester End Examination :	70Marks
Practical :	1hr/week Drawing Class	Credits :	3

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.

MSEI-4-a) BRIDGE ENGINEERING

(Elective-II)

Pre-Requisites: None

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

CO1	Design theories for super structure and substructure of bridges
CO2	Design Culvert, R.C.C T Beam Bridge.
CO3	Understand the behavior of continuous bridges, box girder bridges.
C04	Possess the knowledge to design prestressed concrete bridges.
C05	DesignRailwaybridges,Plategirderbridges,differenttypesofbearings,abutments,piers and various types of foundations for Bridges

Mapping of Course Outcomes with Program Outcomes:

Course Out Comes	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	--	1	2	1	--	1	--
CO2	--	1	2	3	--	2	2
CO3	--	1	2	3	--	2	1
CO4	--	1	2	2	--	2	1
CO5	--	1	2	3	--	2	2

1. **Slightly2.Moderately3.Substantially**

Detailed Syllabus: UNIT: 1

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

UNIT: 2

SuperStructure:Slabbridge-Wheelloadonslab-effectivewidthmethod-slabssupported ontwoedges-cantileverslabs-dispersionlength-Designofinteriorpanelofslab-Pigeaud's method-designoflongitudinalgirders-Guyon-Messonetmethod-HendryJaegarmethod-Courbon'stheory.(Ref:IRC-21),voidedslabs,T-Beambridges.

UNIT: 3

Plategirderbridges-Elementsofplategirderandtheirdesign-web-flange-intermediate stiffener-verticalstiffeners-bearingstiffener-designproblem

UNIT: 4

Prestressed Concrete and Composite bridges- Preliminary dimensions-flexural and torsional parameters- Courbon's Theory – Distribution coefficients by exact analysis- design of girder section- maximum and minimum prestressing forces- eccentricity- live loadanddeadloadshearforces-cablezoneingirder-checkforstressesatvarioussections-checkfordiagonaltension-diaphragmsandendblockdesign-shorttermand longterm deflections- Composite action of composite brides- shear connectors- composite or transformedsection-designproblem.(Ref:IRC:Section-VI)

UNIT: 5

Substructure-Abutments-Stabilityanalysisofabutments-piers-loadsonpiers–Analysis ofpiers-Designproblem(Ref:IRC-13,IRC-21,IRC-78)-Pipeculvert-Flowpatterninpipe culvers- culvert alignment-culvert entrance structure- Hydraulic design and structural designofpipeculverts-reinforcementsinpipes.(Ref:IRC:SP-13)

TEXTBOOKS

1. DesignofConcreteBridges-M.G.Aswini,V.N.Vazirani,M.MRatwani,KhannaPublishers
2. EssentialsofBridgeEngineering-JhonsonVictorD,7e,OxfordIBHPublications

REFERENCES:

1. DesignofBridgesbyN.KrishnaRajuCBSPublishersandDistributors
2. BridgeEngineeringbyS.Ponnuswamy,McGrawhillPublications
3. IRC6-2016StandardSpecificationsandCodeofPracticeforRoadbridges
4. IRC21-2009StandardSpecificationsandcodeofpracticeforRoadBridgesSectionIII

IV Year – II Semester		**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**
PROGRAM ELECTIVE – VII a). PRE-STRESSED CONCRETE					

Course Learning Objectives:

The objective of this course is:

- Familiarize Students with concepts ofprestressing
- Equip student with different prestressing systems anddevices
- Understand losses of prestress including short and longtermlosses
- Familiarize students with analysis and design of prestressed concrete members under flexure, shear andtorsion

Course Outcomes**:**

- At the end of this course the student will be ableto
- Understand different methods ofprestressing
- Estimate effective prestress including short and longtermlosses
- Analyze and design prestressed concrete beams under flexureandshear
- Understand the relevant IS Code provisions for prestressedconcrete

SYLLABUS:

UNIT-I Introduction &Methods and Systems of prestressing Historic development- General principles of prestressing pretensioning and post tensioning- Advantages and limitations of Prestressed concrete- General principles of PSC- Classification and types of prestressing- Materials- high strength concrete and high tensile steel their characteristics. Pretensioning and Posttensioning methods and systems of prestressing like Hoyer system, Magnel Blaton system, Freyssinet system and Gifford- Udall System- Lee McCall system

Flexure: Analysis of sections for flexure- beams prestressed 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 prestress 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 Deflections: Importance of control of deflections- Factors influencing deflections – Short term deflections of uncracked beams- prediction of long time deflections- IS code requirements.

Composite Beams: Different Types- Propped and Unpropped- stress distribution- Differential shrinkage- Analysis of composite beams- Deflection of determinate composite beam.

UNIT-V 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, Control of deflections- Factors influencing Deflection- Prediction of short term and longtermdeflections.

Text Books:-

1. Prestressed Concrete by N.Krishna Raju, 6e Tata Mc Graw Hill Bookco.
2. Prestressed Concrete by K.U.Muthu PHI Learning Pvt.Ltd.

References:

1. Design of prestress concrete structures by T.Y. Lin and Burn, John Wiley, NewYork.
2. Prestressed Concrete by N. RajagopalanNarosa PublishingHouse.
3. Prestressed concrete by S. RamamruthamDhanpat Rai & Sons, Delhi.
4. IS1343:2012

IV Year – II Semester		**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**
PROGRAM ELECTIVE – VII b). Advanced Structural Analysis					

Course LearningObjectives:

The objective of this courses:

- Familiarize Students with Different types ofStructures
- Equip student with conceptsofArches
- Understand Concepts of lateralLoadanalysis
- Familiarize Cables andSuspensionBridges
- Understand Analysis methods Moment Distribution, Kanis Method and Matrixmethods

Course Outcomes**:**

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

- Differentiate Determinate and IndeterminateStructures
- Carryout lateral Load analysisofstructures
- Analyze Cable and SuspensionBridgestructures
- Analyze structures using Moment Distribution, Kani's Method andMatrixmethods

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's first theorem-Deflections of simple beams and pin jointed planetrusses.

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 differentlevels.

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 suspensionbridges.

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,NewDelhi.
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, NewDelhi**.**
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.

IV Year – II Semester		**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**
PROGRAM ELECTIVE – VII c). Low-Cost Housing					

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- Impedimently 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- Effectincey 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 safe

TEXT BOOKS:

1. Building materials for low –income houses – International council for building research studies anddocumentation.
2. Modern trends in housing in development countries – A.G. Madhava Rao, D.S. Ramachnadra Murthy & G.Annamalai
3. Light weight concrete- Academic Kiado- Rudhai. G – Publishing home of Hungarian Academy of Sciences1963.

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 – Newage internationalpublishers.
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

PROJECT WORK

The main objective of the Project work is

- To enable the student, apply engineering knowledge that has been taught all through the programme for solving practical engineeringproblem.
- To enable the student capable for problem solving / problemshooting.
- To instill and inculcate team spirit/ team work in to the minds ofthestudents.
- To enable/ train the students reportmaking/documentation.
- Toprovidestudentsanopportunitytouseanycivilengineering software for theirprojectwork.

Outcomes of the Project work.

Up on completion of the Project work, the student will be able to

- Apply all levels of Engineering knowledge in solving theEngineeringproblems.
- Work together withteamspirit.
- Use Civil Engineering software atleastone.
- Documenttheprojects