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

COURSE STRUCTURE

I Year – I SEMESTER

Sl. No	Course Code	Subjects	L	T	P	Credits
1	BS1101	Mathematics – I (Calculus & Differential Equations)	3	0	0	3
2	HS1101	Communicative English	3	0	0	3
3	BS1102	Engineering Physics	3	0	0	3
4	ES1101	Building Materials and Construction	1	0	4	3
5	ES1102	Engineering Graphics	2	0	2	3
6	HS1102	English Communication Skills Lab	0	0	3	1.5
7	BS1103	Engineering Physics Lab	0	0	3	1.5
8	ES1103	Basics of Civil Engg. Workshop (Lab)	0	0	3	1.5
9	MC1101	Constitution of India	2	0	0	0
		Total Credits				**19.5**

I Year – II SEMESTER

Sl. No	Course Code	Subjects	L	T	P	Credits
1	BS1201	Mathematics – II (Linear Algebra & Numerical Methods)	3	0	0	3
2	ES1201	Surveying	3	0	0	3
3	BS1202	Engineering Chemistry	3	0	0	3
4	ES1202	Programming for Problem Solving Using C	3	0	0	3
5	ES1203	Engineering Mechanics	3	0	0	3
6	BS1203	Engineering Chemistry Lab	0	0	3	1.5
7	ES1204	Surveying Field Work 1	0	0	3	1.5
8	ES1205	Programming for problem Solving Using C Lab	0	0	3	1.5
9	MC1201	Environmental Science	3	0	0	0
10	BS1204	Physics Virtual Lab	0	0	2	0
11	MC1202	Physical Fitness Activities	0	0	3	0
		Total Credits				**19.5**

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

II YEAR: I- SEMESTER

Sl. No.	Course Code	Course Title	L	T	P	Credits
1	BS2101	Mathematics - III	3	0	0	3
2	PC2101	Strength of Materials	3	0	0	3
3	PC2102	Fluid Mechanics	3	0	0	3
4	PC2103	Structural Analysis - I	3	0	0	3
5	PC2104	Concrete Technology	3	0	0	3
6	PC2105	Strength of Materials Lab	0	0	3	1.5
7	PC2106	Building Planning & Drawing	0	0	3	1.5
8	PC2107	Concrete Technology Lab	0	0	3	1.5
9	SC2101	Skill oriented course (Computer Aided Drawing LAB)	1	0	2	2
		Total Credits				**21.5**

II YEAR: II- SEMESTER

Sl. No.	Course Code	Course Title	L	T	P	Credits
1	BS2201	Probability and Statistics/ (M-IV)	3	0	0	3
2	PC2201	Structural Analysis - II	3	0	0	3
3	PC2202	Hydraulics and Hydraulic Machinery	3	0	0	3
4	ES2201	Engineering Geology	3	0	0	3
5	HS2201	Managerial Economics and Financial Analysis	3	0	0	3
6	PC2203	Surveying Field Work - II	0	0	2	1
7	ES2202	Engineering Geology Lab	0	0	3	1.5
8	PC2204	Fluid Mechanics & Hydraulics Machinery Lab	0	0	3	1.5
9	SC2201	Skill Oriented Course*	2	0	0	0
		Honors/ Minor courses (The hours distribution can be 3-0-2 or 3-1-0 also)	3	0	2	4
		Total Credits				**19**

III YEAR: I- SEMESTER

Sl. No.	Course Code	Course Title	L	T	P	Credits
1	PC3101	Design of Reinforced Concrete Structures	3	0	0	3
2	PC3102	Geotechnical Engineering - I	3	0	0	3
3	PC3103	Transportation Engineering - I	3	0	0	3
4	PE3101 (PE-I)	Construction Technology & Management	3	0	0	3
5	PC3104	Geotechnical Engineering Lab	0	0	3	1.5
6	PC3105	Transportation Engineering Lab	0	0	3	1.5
7	OE3101	Open Elective Courses/ Job oriented elective	3	0	0	3
8	SS3101	Skill advanced course/ soft skills course* (Total Station & GPS)	1	0	2	1.5
9	SI3101	Summer Internship				1.5
		Total Credits				**21.5**

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	Water Resources Engineering – I	3	0	0	3
3	PC3203	Geotechnical Engineering - II	3	0	0	3
4	PC3203	Environmental Engineering	3	0	0	3
5	PE3201 (PE-II)	Estimation Specification & Contracts	3	0	0	3
6	OE3201 (OE-II)	Open Elective – II	3	0	0	3
7	PC3204	Environmental Engineering Lab	0	0	3	1.5
8	SS3201	Skill Advanced Course/ soft skill course*	1	0	2	2
9	MC3201	Mandatory Course	0	0	0	0
10	RI3201	Industrial/ Research Internship (Mandatory 2 months)	0	0	0	0
		Total Credits				**21.5**

IV YEAR: I- SEMESTER

Sl. No.	Course Code	Course Title	L	T	P	Credits
1	PE4101 (PE-III)	Pre-stressed Concrete	3	0	0	3
2	PE4102 (PE-IV)	Water Resources Engineering - II	3	0	0	3
3	OE4101 (OE-III)	Remote Sensing & GIS	3	0	0	3
4	OE4102 (OE IV)	Waste water Treatment	3	0	0	3
5	HS4101 (HS4101)	IPR & Patents	3	0	0	3
6	PE4103 (PE-V)	Design and Drawing of Irrigation Structures	0	0	3	1.5
7	PE4104	Remote sensing & GIS Lab	0	0	3	1.5
8	RI4101	Industrial/ Research Internship	0	0	0	3
9	SS4101	Soft Skills	1	0	2	2
		Total Credits				**23**

IV YEAR: II- SEMESTER

Sl. No.	Course Code	Course Title	L	T	P	Credits
1	PROJ	Project Project Work, Seminar & internship in industry	0	0	0	12
		INTERNSHIP (6 MONTHS)				
		Total Credits				**12**

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		Ground Improvement Techniques	3	0	1	4
5		Machine Foundations	3	0	1	4
6		Design of Geosynthetics	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		Urban Transportation Planning	3	0	1	4
2		Pavement Analysis and Design	3	0	1	4
3		Pavement Construction and Evaluation	3	0	1	4
4		Land use and Transportation planning	3	0	1	4
5		Pavement management Systems	3	0	1	4
6		Transport economics and project appraisal	3	0	1	4
7		Transportation systems management	3	0	1	4
8		Traffic analysis	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
		Total Credits				**20**

I Year - I Semester		**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**
MATHEMATICS – I **(BS1101)** **(Common to ALL branches of First Year B.Tech**					

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

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

UNIT – I: Sequences, Series and Mean value theorems: **(10 hrs)**
Sequences and Series: Convergences and divergence – Ratio test – Comparison tests – Integral test – Cauchy's root test – Alternate series – Leibnitz's rule.
Mean Value Theorems (without proofs): Rolle's Theorem – Lagrange's mean value theorem – Cauchy's mean value theorem – Taylor's and Maclaurin's theorems with remainders, Problems and applications on the above theorem.

UNIT – II: Differential equations of first order and first degree: **(10 hrs)**
Linear differential equations – Bernoulli's equations – Exact equations and equations reducible to exact form.

Applications: Newton's Law of cooling – Law of natural growth and decay – Orthogonal trajectories – Electrical circuits.

UNIT – III: Linear differential equations of higher order: **(10 hrs)**
Homogeneous and Non-homogeneous differential equations of higher order with constant coefficients – with non-homogeneous term of the type e^{ax}, sin ax, cos ax, polynomials in x^n, $e^{ax}V(x)$ and $x^nV(x)$ – Method of Variation of parameters, Cauchy and Legendre's linear equations.

Applications: LCR circuit, Simple Harmonic motion.

UNIT – IV: Partial differentiation: **(10 hrs)**
Introduction – Homogeneous function – Euler's theorem – Total derivative – Chain rule – Jacobian – Functional dependence – Taylor's and MacLaurin's series expansion of functions of two variables.

Applications: Maxima and Minima of functions of two variables without constraints and Lagrange's method.

UNIT – V: Multiple integrals: (8 hrs)

Double and Triple integrals – Change of order of integration in double integrals – Change of variables to polar, cylindrical and spherical coordinates.

Applications: Finding Areas and Volumes.

Text Books:

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

Reference Books:

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

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

Unit 1:
Lesson-1: A Drawer full of happiness from "**Infotech English**", Maruthi Publications
Lesson-2: Deliverance by Premchand from "**The Individual Society",** Pearson Publications.
    (Non-detailed)

Listening: Listening to short audio texts and identifying the topic. Listening to short audio texts and identifying 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 Bansodefrom "**The Individual Society",** Pearson Publications. (Non-detailed)

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

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

Reading: Identifying sequence of ideas; recognizing verbal techniques that help to link the ideas in a paragraph together.

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

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

Grammar: Use of articles and zero article; prepositions.

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

Unit 3:

Lesson-1: Stephen Hawking-Positivity 'Benchmark' from "**Infotech English**", Maruthi Publications
Lesson-2: Shakespeare's Sister by Virginia Woolf from "**The Individual Society",** Pearson Publications. (Non-detailed)
Listening: Listening for global comprehension and summarizing what is listened to, both in speaking and writing.

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

Reading: Reading a text in detail by making basic inferences - recognizing and interpreting specific context clues; strategies to use text clues for comprehension. Critical reading.

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

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

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

Pronunciation: word stress-poly-syllabic words

Unit 4:
Lesson-1: Liking a Tree, Unbowed: Wangari Maathai-biography from "**Infotech English**", Maruthi Publications
Lesson-2: Telephone Conversation-Wole Soyinka from "**The Individual Society",** Pearson Publications**.** (Non-detailed)
Listening: Making predictions while listening to conversations/ transactional dialogues without video (only audio); listening to audio-visual texts.

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

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

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

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

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

Pronunciation: Contrastive Stress

Unit 5:

Lesson-1: Stay Hungry-Stay foolish from "**Infotech English**", Maruthi Publications
Lesson-2: Still I Rise by Maya Angelou from "**The Individual Society",** Pearson Publications. (Non-detailed)
Listening: Identifying key terms, understanding concepts and interpreting the concepts both in speaking and writing.

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

Reading: Reading for comprehension. RAP Strategy Intensive reading and Extensive reading techniques.

Reading for Writing: Writing academic proposals- writing research articles: format and style.
Vocabulary: Technical vocabulary from across technical branches (20 words) GRE Vocabulary (20 words) (Antonyms and Synonyms, Word applications) Coherence, matching emotions.

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

Pronunciation: Stress in compound words

Prescribed text books for theory:
      1. "**Infotech English**", Maruthi Publications. (Detailed)
      2. "**The Individual Society",** Pearson Publications. (Non-detailed)

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

I Year - I Semester		L	T	P	C
		3	0	0	3
	ENGINEERING PHYSICS (BS1102) **(For All Non-Circuital Branches like ME, CE, Chemical etc.)**				

COURSE OBJECTIVES

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

COURSE OUTCOMES

1. Explain the need of coherent sources and the conditions for sustained interference (L2). **Identify** applications of interference in engineering (L3). **Analyze** the differences between interference and diffraction with applications (L4). **Illustrate** the concept of polarization of light and its applications (L2). **Classify** ordinary polarized light and extraordinary polarized light (L2) The different realms of physics and their applications in both scientific and technological systems are achieved through the study of wave optics.

2. Explain various types of emission of radiation (L2). **Identify** lasers as tools in engineering applications (L3). **Describe** the construction and working principles of various types of lasers (L1). **Explain** the working principle of optical fibers (L2). **Classify the** optical fibers based on refractive index profiles and modes of propagation (L2). **Identify** the applications of optical fibers in medical, communication and other fields (L2). **Apply** the fiber optic concepts in various fields (L3).

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

4. Explain sound waves and its propagation/absorption of construction material used in design of buildings (L2). **Analyze** acoustic parameters of typical materials used in buildings (L4). **Recognize** sound level disruptors and their application in architectural acoustics (L2). **Identify** the use of ultrasonics in diversified fields of engineering (L3)

5. Interpret various crystal systems (L2) and **Analyze** the characterization of materials by XRD (L4). **Identify** the important properties of crystals like the presence of long-range order and periodicity, structure determination using X-ray diffraction technique (L3). **Analysis** of structure of

the crystals by Laue and Powder techniques (L2)

Unit-I: Wave Optics   12hrs

Interference: Principle of superposition –Interference of light - Interference in thin films (Reflection Geometry) & applications -Colors in thin films- Newton's Rings- Determination of wavelength and refractive index.

Diffraction: Introduction - Fresnel and Fraunhofer diffraction - Fraunhofer diffraction due to single slit, double slit - N-slits(Qualitative) – Grating - Dispersive power and resolving power of Grating(Qualitative).

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

Unit Outcomes:
The students will be able to
- ➢ **Explain** the need of coherent sources and the conditions for sustained interference (L2)
- ➢ **Identify** engineering applications of interference (L3)
- ➢ **Analyze** the differences between interference and diffraction with applications (L4)
- ➢ **Illustrate** the concept of polarization of light and its applications (L2)
- ➢ **Classify** ordinary polarized light and extraordinary polarized light (L2)

Unit-II: Lasers and Fiber optics   10hrs

Lasers: Introduction – Characteristics of laser – Spontaneous and Stimulated emissions of radiation – Einstein's coefficients – Population inversion –Lasing action- Pumping mechanisms – Ruby laser – He-Ne laser - Applications of lasers.

Fiber optics: Introduction –Principle of optical fiber- Acceptance Angle-Numerical Aperture- Classification of optical fibers based on refractive index profile and modes –Propagation of electromagnetic wave through optical fibers - Applications.

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

UNIT III: Engineering Materials   8hrs

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

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

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

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

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

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

Unit Outcomes:
The students will be able to
- **Explain** how sound is propagated in buildings (L2)
- **Analyze** acoustic properties of typically used materials in buildings (L4)
- **Recognize** sound level disruptors and their use in architectural acoustics (L2)
- **Identify** the use of ultrasonics in different fields (L3)

Unit-V: Crystallography and X-ray diffraction   **8hrs**

Crystallography: Space lattice, Basis, Unit Cell and lattice parameters – Bravais Lattice – crystal systems (3D) – coordination number - packing fraction of SC, BCC & FCC - Miller indices – separation between successive (hkl) planes.
X-ray diffraction: Bragg's law - X-ray Diffractometer – crystal structure determination by Laue's and powder methods.

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

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

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

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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I Year - I Semester		L	T	P	C
		1	0	4	3
	ENGINEERING DRAWING/GRAPHICS (ES1101)				

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

Unit I
Objective: To introduce the students to use drawing instruments and to draw polygons, Engg. Curves.

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

Curves: Parabola, Ellipse and Hyperbola by general and special methods, cycloids, involutes, tangents &normals for the curves.

Scales: Plain scales, diagonal scales and vernier scales

Unit II
Objective: To introduce the students to use orthographic projections, projections of points & simple lines. To make the students draw the projections of the lines inclined to both the planes.

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

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

Unit III
Objective: The objective is to make the students draw the projections of the plane inclined toboth the planes.

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

Unit IV
Objective: The objective is to make the students draw the projections of the various types of solids in different positions inclined to one of the planes.

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

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

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

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

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

TEXT BOOKS:

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

REFERENCE BOOKS:

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

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

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:

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

I Year - I Semester		L	T	P	C
		0	0	3	1.5
	ENGINEERING PHYSICS LAB (BS1103) **(For All Non-Circuital Branches like ME, CE, Chemical etc)**				

(Any 10 of the following listed experiments)

List of Engineering Physics Experiments

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

References:

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

I Year - I Semester		**L**	**T**	**P**	**C**
		0	**0**	**3**	**1.5**
BASICS OF CIVIL ENGG. (WORK SHOP) LAB (ES1104)					

COURSE OBJECTIVES:

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

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

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

LIST OF EXPERIMENTS

1. Demonstration on usage of chain
2. Ranging – offsets – chain-age
3. To find the area of an irregular polygon using chain by using horizontal measurements
4. Determination of bearings and included angles with prismatic compass.
5. Demonstration on various Building materials used in construction
6. Estimation of quantity of bricks, concrete, wood, paint for the given single room building
7. Masonry work hands – on practice work deferent types of bonds in brick masonry
8. Identification of quality of brick through physical tests
9. Identification of soil based on their physical properties
10. Setting out of building: The student is required to set out a building (Single room only) as per the given building plan using tape and cross staff.
11. Demonstration on Installation of simple sanitary fittings and fixtures like Tap, T-joint, Elbow, bend, threading etc.
12. Finding the discharge velocity in a water pipe line also find density of water
13. Computation of Centre of gravity and moment of inertial of (i) I-section and (ii) Channel section.
14. Welding (arc welding and gas welding)
15. Carpentry (Demonstration)

16. Identify deferent types of roads in the campus and
    write the physical characteristics of layers
17. Demonstration on making of cement mortar/concrete
    for the given nominal mix
18. Study of given Topo-sheet

REFERENCE BOOKS
1. Laboratory Manual for Basic Civil Engineering
workshops

	L	T	P	C

II Year - I Semester   **2**   **0**   **0**   **0**

CONSTITUTION OF INDIA (MC1101)

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

UNIT-I
Introduction to Indian Constitution: Constitution meaning of the term, Indian Constitution - Sources and constitutional history, Features - Citizenship, Preamble, Fundamental Rights and Duties, Directive Principles of State Policy.
Learning outcomes: After completion of this unit student will
> Understand the concept of Indian constitution
> Apply the knowledge on directive principle of state policy
> Analyze the History, features of Indian constitution
> Evaluate Preamble Fundamental Rights and Duties

UNIT-II
Union Government and its Administration Structure of the Indian Union: Federalism, Centre- State relationship, President: Role, power and position, PM and Council of ministers, Cabinet and Central Secretariat, LokSabha, RajyaSabha, The Supreme Court and High Court: Powers and Functions;
Learning outcomes:-After completion of this unit student will
> Understand the structure of Indian government
> Differentiate between the state and central government
> Explain the role of President and Prime Minister
> Know the Structure of supreme court and High court

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

Learning outcomes: -After completion of this unit student will
> Understand the structure of state government
> Analyze the role Governor and Chief Minister
> Explain the role of state Secretariat
> Differentiate between structure and functions of state secretariat

UNIT-IV

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

Learning outcomes:-After completion of this unit student will

Understand the local Administration

Compare and contrast district administration role and importance

Analyze the role of Myer and elected representatives of Municipalities

Evaluate Zillapanchayat block level organisation

UNIT-V

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

Learning outcomes:-After completion of this unit student will

Know the role of Election Commission apply knowledge

Contrast and compare the role of Chief Election commissioner and Commissiononerate

Analyze role of state election commission

Evaluate various commissions of viz SC/ST/OBC and women

References:

Durga Das Basu, Introduction to the Constitution of India, Prentice – Hall of India Pvt. Ltd.. New Delhi

SubashKashyap, Indian Constitution, National Book Trust

J.A. Siwach, Dynamics of Indian Government & Politics

D.C. Gupta, Indian Government and Politics

H.M.Sreevai, Constitutional Law of India, 4th edition in 3 volumes (Universal Law Publication)

J.C. Johari, Indian Government andPolitics Hans

J. Raj IndianGovernment and Politics

M.V. Pylee, Indian Constitution Durga Das Basu, Human Rights in Constitutional Law, Prentice – Hall of India Pvt. Ltd.. New Delhi

Noorani, A.G., (South Asia Human Rights Documentation Centre), Challenges to Civil Right),

Challenges to Civil Rights Guarantees in India, Oxford University Press 2012 **resources**:

nptel.ac.in/courses/109104074/8

nptel.ac.in/courses/109104045/

nptel.ac.in/courses/101104065/

www.hss.iitb.ac.in/en/lecture-details

www.iitb.ac.in/en/event/2nd-lecture-institute-lecture-series-indian-constitution

I Year – II Semester		L	T	P	C
		0	0	3	
MATHEMATICS-II (BS1201) **(Common to ALL branches of First 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 the approximate roots of polynomial and transcendental equations by different algorithms (L5)
- apply Newton's forward & backward interpolation and Lagrange's formulae for equal and unequal intervals (L3)
- apply numerical integral techniques to different Engineering problems (L3)
- apply different algorithms for approximating the solutions of ordinary differential equations with initial conditions to its analytical computations (L3)

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

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

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

Cayley-Hamilton theorem (without proof) – Applications – Finding the inverse and power of a matrix by Cayley-Hamilton theorem – Reduction to Diagonal form – Quadratic forms and nature of the quadratic forms – Reduction of quadratic form to canonical forms by orthogonal transformation.

Singular values of a matrix, singular value decomposition (text book-3).

UNIT – III: Iterative methods: **(8 hrs)**

Introduction – Bisection method – Secant method – Method of false position – Iteration method – Newton-Raphson method (One variable and simultaneous Equations) – Jacobi and Gauss-Seidel methods for solving system of equations numerically.

UNIT – IV: Interpolation: (10 hrs)

Introduction – Errors in polynomial interpolation – Finite differences – Forward differences – Backward differences – Central differences – Relations between operators – Newton's forward and backward formulae for interpolation – Interpolation with unequal intervals – Lagrange's interpolationformula – Newton's divide difference formula.

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

Numerical differentiation using interpolating polynomial – Trapezoidal rule – Simpson's $1/3^{rd}$ and $3/8^{th}$ rule– Solution of initial value problems by Taylor's series – Picard's method of successive approximations – Euler's method –Runge-Kutta method (second and fourth order).

Text Books:
1. **B. S. Grewal,** Higher Engineering Mathematics, 44th Edition, Khanna Publishers.
2. **B. V. Ramana,**Higher Engineering Mathematics, 2007 Edition, Tata Mc. Graw HillEducation.
3. **David Poole,** Linear Algebra- A modern introduction, 4th Edition, Cengage.

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

I Year – II Semester		**L**	**T**	**P**	**C**
			0	**0**	**3**
	SURVEYING (ES1201)				

Course Objectives:

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

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

Course Outcomes: Course will enable the student to:

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

SYLLABUS

UNIT - I

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

Measurement of Distances and Directions

Linear distances- Approximate methods, Direct Methods- Chains- Tapes, ranging, Tape corrections.

Prismatic Compass- Bearings, included angles, Local Attraction, Magnetic Declination, and dip – systems and Q.B. system of locating bearings.

UNIT - II

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

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

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

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

UNIT - III

Theodolite Surveying: Types of Theodolites, temporary adjustments, measurement of horizontal angle by repetition method and reiteration method, measurement of vertical Angle, 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., New Delhi.
2. Chandra A M, "Plane Surveying and Higher Surveying", New age International Pvt. Ltd., Publishers, New Delhi.
3. Duggal S K, "Surveying (Vol – 1 & 2), Tata McGraw Hill Publishing Co. Ltd. New Delhi.

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

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

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

COURSE OBJECTIVES

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

UNIT I: POLYMER TECHNOLOGY   8 hrs

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

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

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

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

   Course Outcomes: *At the end of this unit, the students will be able to*
- *Analyze* the different types of composite plastic materials and *interpret* the mechanism of conduction in conducting polymers.

UNIT II: ELECTROCHEMICAL CELLS AND CORROSION   10 hrs

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

*Corrosion:-*Definition, theories of corrosion (chemical and electrochemical), galvanic corrosion, differential aeration corrosion, stress corrosion, galvanic series, factors influencing rate of corrosion, corrosion control (proper designing and cathodic protection), Protective coatings (surface preparation,

cathodic coatings, anodic coatings, electroplating and electroless plating [nickel]), Paints (constituents, functions and special paints).

Course Outcomes: *At the end of this unit, the students will be able to*
- *Utilize* the theory of construction of electrodes, batteries and fuel cells in redesigning new engineering products and c*ategorize* the reasons for corrosion and study methods to control corrosion.

UNIT III: CHEMISTRY OF MATERIALS   10 hrs
 Part- A:
Nano materials:- Introduction, sol-gel method, characterization by (Brunauer Emmet Teller [BET]), (scanning electron microscopy [SEM]) and (transmission electron microscopy [TEM]) with example (TiO2), applications of graphene and fullerenes, carbon nanotubes (types, preparation and applications)

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

 Part-B:
Refractories: - Definition, classification, properties (refractoriness, refractoriness under load, porosity and thermal spalling), failure of refractories.

Lubricants: - Definition, mechanism of lubricants, properties (definition and importance).

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

 Course Outcomes: *At the end of this unit, the students will be able to*
- *Synthesize* nanomaterials for modern advances of engineering technology.
- *Summarize* the techniques that detect and measure changes of state of reaction.
- *Illustrate* the commonly used industrial materials.

UNIT IV: FUELS   10 hrs
Introduction, calorific value, higher calorific value, lower calorific values, problems using Dulong's formula, proximate and ultimate analysis of coal sample and their significance, numerical problems, petroleum (refining-cracking), synthetic petrol (Fischer Tropsch and Bergius), petrol knocking, diesel knocking, octane and cetane ratings, anti-knocking agents, Introduction to alternative fuels (Bio-diesel, ethanol, methanol, natural gas, liquefied petroleum gas, compressed natural gas), Flue gas analysis by Orsat apparatus, rocket fuels.

 Course Outcomes: *At the end of this unit, the students will be able to*
- *Differentiate* petroleum, petrol, synthetic petrol and have knowledge how they are produced.
- *Study* alternate fuels and a*nalyse* flue gases.

UNIT V: WATER TECHNOLOGY   8 hrs
Hardness of water, determination of hardness by complexometric method, boiler troubles (priming and foaming, scale formation, boiler corrosion, caustic embrittlement), internal treatments, softening of hard water (zeolite process and related sums, ion exchange process), treatment of industrial waste

water, potable water and its specifications, steps involved in purification of water, chlorination, break point chlorination-desalination (reverse osmosis and electro dialysis).

Course Outcomes: *At the end of this unit, the students will be able to*
- *Analyze* the suitable methods for purification and treatment of hard water and brackish water.

Standard Books:

1. P.C. Jain and M. Jain "**Engineering Chemistry**", 15/e, Dhanpat Rai & Sons, Delhi, (Latest edition).
2. Shikha Agarwal, "**Engineering Chemistry**", Cambridge University Press, New Delhi, (2019).
3. S.S. Dara, "**A Textbook of Engineering Chemistry**", S.Chand & Co, (2010).
4. Shashi Chawla, "Engineering Chemistry", Dhanpat Rai Publicating Co. (Latest edition).

Reference:

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

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

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

UNIT I
Introduction to Computers: Creating and running Programs, Computer Numbering System, Storing Integers, Storing Real Numbers
Introduction to the C Language: Background, C Programs, Identifiers, Types, Variable, Constants, Input/output, Programming Examples, Scope, Storage Classes and Type Qualifiers.

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

UNIT II
Bitwise Operators: Exact Size Integer Types, Logical Bitwise Operators, Shift Operators.
Selection & Making Decisions: Logical Data and Operators, Two Way Selection, Multiway Selection, More Standard Functions
Repetition: Concept of Loop, Pretest and Post-test Loops, Initialization and Updating, Event and Counter Controlled Loops, Loops in C, Other Statements Related to Looping, Looping Applications, Programming Examples

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

Strings: String Concepts, C String, String Input / Output Functions, Arrays of Strings, String Manipulation Functions String/ Data Conversion, A Programming Example – Morse Code
Enumerated, Structure, and Union: The Type Definition (Type def), Enumerated Types, Structure, Unions, and Programming Application

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

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

Processor Commands: Processor Commands

UNIT V

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

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

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

TEXTBOOKS:

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

REFERENCES:

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

COURSE OUTCOMES:

Upon the completion of the course the student will learn

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

I Year - II Semester		L	T	P	C
		3	0	0	3
	ENIGINEERING MECHANICS (ES1203)				

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

   The students are to be exposed to the concepts of force and friction, direction and its application.
   The students are to be exposed to application of free body diagrams. Solution to problems using graphical methods and law of triangle of forces.
   The students are to be exposed to concepts of centre of gravity.
   The students are to be exposed to concepts of moment of inertia and polar moment of inertia including transfer methods and their applications.
   The students are to be exposed to motion in straight line and in curvilinear paths, its velocity and acceleration computation and methods of representing plane motion.
   The students are to be exposed to concepts of work, energy, and particle motion.

UNIT – I   Introduction to Engg. Mechanics – Basic Concepts.
Systems of Forces: Coplanar Concurrent Forces – Components in Space – Resultant – Moment of Force and its Application – Couples and Resultant of Force Systems.
Equilibrium of Systems of Forces: Free Body Diagrams, Equations of Equilibrium of Coplanar Systems, and Spatial Systems for concurrent forces. Lamis Theorem, 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 of Composite Figures
Centre of Gravity: Centre of gravity of simple body (from basic principles), Centre of gravity of composite bodies, Pappus theorem.
Area moments of Inertia: Definition – Polar Moment of Inertia, Transfer Theorem, Moments of Inertia of Composite Figures, Products of Inertia, Transfer Formula for Product of Inertia. **Mass Moment of Inertia:** Moment of Inertia of Masses, Transfer Formula for Mass Moments of Inertia, mass moment of inertia of composite bodies

UNIT – 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 Rigid Body – Types and their Analysis in Planar Motion.
Introduction – Rectilinear motion – Motion with uniform and variable acceleration– Curvilinear motion–
Components of motion– Circular motion – Projectiles- Instantaneous 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.

TEXTBOOKS:

Engineering Mechanics - S. Timoshenko & D. H. Young., 4th Edn, Mc Graw Hill publications.
Engineering Mechanics statics and dynamics – R. C. Hibbeler, 11thEdn – Pearson Publ.

REFERENCES:

Engineering Mechanics, statics and Dynamics, J.L. Meriam, 6thEdn – Wiley India Pvt Ltd.
Engineering Mechanics: Statics and Dynamics 3rd edition, Andrew Pytel and JaanKiusalaas, Cengage Learning publishers.
Engineering Mechanics, dynamics, Bhavikatti S.S – NewAge International Publishers.
Engineering Mechanics, statics and dynamics – I.H. Shames, – Pearson Publications
Mechanics for Engineers, statics - F.P.Beer & E.R.Johnston – 5thEdn Mc Graw Hill Publ.
Mechanics for Engineers, dynamics - F.P.Beer& E.R.Johnston – 5thEdn Mc Graw Hill Publ.
Theory & Problems of engineering mechanics, statics & dynamics –

Engineering Mechanics, Fedinand. L. Singer, Harper – Collins.
Engineering Mechanics statics and dynamics, A Nelson, Mc Graw Hill publications
10.Engineering Mechanics, Tayal. Umesh Publications.

I Year - II Semester		L	T	P	C
		0	0	3	1.5
	ENGINEERING CHEMISTRY LAB (BS1203)				

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

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

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

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

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

I Year - II Semester		**L**	**T**	**P**	**C**
		0	**0**	**3**	**1.5**
	SURVEYING FIELD WORK-1 (ES1204)				

List of Field Works:

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

   Note: Any 10 field work assignments must be completed.
   ***

I Year - II Semester		**L**	**T**	**P**	**C**
		0	**0**	**3**	**1.5**
PROBLEM SOLVING & PROGRAMMING USING C LAB (ES1205)					

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

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

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

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

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

Exercise 5:
1. Write a program in C to print all unique elements in an array.
2. Write a program in C to separate odd and even integers in separate arrays.
3. Write a program in C to sort elements of array in ascending order.

Exercise 6:
1. Write a program in C for multiplication of two square Matrices.
2. Write a program in C to find transpose of a given matrix.

Exercise 7:
1. Write a program in C to search an element in a row wise and column wise sorted matrix.
2. Write a program in C to print individual characters of string in reverse order.

Exercise 8:
1. Write a program in C to compare two strings without using string library functions.
2. Write a program in C to copy one string to another string.

Exercise 9:
1. Write a C Program to Store Information Using Structures with Dynamically Memory Allocation
2. Write a program in C to demonstrate how to handle the pointers in the program.

Exercise 10:
1. Write a program in C to demonstrate the use of & (address of) and *(value at address) operator.
2. Write a program in C to add two numbers using pointers.

Exercise 11:
1. Write a program in C to add numbers using call by reference.
2. Write a program in C to find the largest element using Dynamic Memory Allocation.

Exercise 12:
1. Write a program in C to swap elements using call by reference.
2. Write a program in C to count the number of vowels and consonants in a string using a pointer.

Exercise 13:
1. Write a program in C to show how a function returning pointer.
2. Write a C program to find sum of n elements entered by user. To perform this program, allocate memory dynamically using malloc( ) function.

Exercise 14:
1. Write a C program to find sum of n elements entered by user. To perform this program, allocate memory dynamically using calloc( ) function. Understand the difference between the above two programs
2. Write a program in C to convert decimal number to binary number using the function.

Exercise 15:
1. Write a program in C to check whether a number is a prime number or not using the function.
2. Write a program in C to get the largest element of an array using the function.

Exercise 16:
1. Write a program in C to append multiple lines at the end of a text file.
2. Write a program in C to copy a file in another name.
3. Write a program in C to remove a file from the disk.

Course Outcomes:
By the end of the Lab, the student
1) Gains Knowledge on various concepts of a C language.
2) Able to draw flowcharts and write algorithms.
3) Able design and development of C problem solving skills.
4) Able to design and develop modular programming skills.
5) Able to trace and debug a program.

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

Learning Objectives:
The objectives of the course are to impart:

- Overall understanding of the natural resources.
- Basic understanding of the ecosystem and its diversity.
- Acquaintance on various environmental challenges induced due to unplanned anthropogenicactivities.
- 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 modernagriculture, 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 nationaland 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 Air pollution, Water pollution, Soil pollution, Noise pollution, Nuclear hazards. Role of an individual in prevention of pollution. - Pollution case studies, Sustainable Life Studies. Impact of Fire Crackers on Men and his well being.

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

UNIT – V

Social Issues and the Environment: Urban problems related to energy -Water conservation, rain water harvesting - Resettlement and rehabilitation of people; its problems and concerns. Environmental ethics: Issues and possible solutions. Environmental Protection Act -Air (Prevention and Control of Pollution) Act. –Water (Prevention and control of Pollution) Act -Wildlife Protection Act -Forest Conservation Act-Issues involved in enforcement of environmental legislation.

-Public awareness.

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

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

Text Books:

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

Reference:

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

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

PHYSICS VIRTUAL LAB (BS1109)

II Year
I Semester

II Year - I Semester		**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**
	MATHEMATICS-III (BS2101) (Common to ALL Branch's of II Year B. Tech.)				

Course Objectives:

To familiarize the techniques in partial differential equations.
To furnish the learners with basic concepts and techniques at plus two level to lead them into advanced level by handling various real-world applications.

Course Outcomes: At the end of the course, the student will be able to
Interpret the physical meaning of different operators such as gradient, curl and divergence (L5)
Estimate the work done against a field, circulation and flux using vector calculus (L5)
Apply the Laplace transform for solving differential equations (L3).
Find or compute the Fourier series of periodic signals (L3)
Know and be able to apply integral expressions for the forwards and inverse Fourier transform to a range of non-periodic waveforms (L3)
Identify solution methods for partial differential equations that model physical processes (L3)

UNIT I: Vector calculus: **(10 hrs)**
Vector Differentiation: Gradient — Directional derivative — Divergence — Curl — Scalar Potential.
Vector Integration: Line integral — Work done — Area — Surface and volume integrals — Vector integral theorems: Greens, Stokes and Gauss Divergence theorems (without proof).

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.

Textbooks:

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

Reference Books:

Erwin Kreyszig, Advanced Engineering Mathematics, 10th Edition, Wiley-India.
Dean. G. Duffy, Advanced Engineering Mathematics with MATLAB, 3rd Edition, CRC
Press.
Peter O' Neil, Advanced Engineering Mathematics, Cengage.
Srimantha Pal, S C Bhunia, Engineering Mathematics, Oxford University Press.

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 cross sections.

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

To classify cylinders based on their thickness and to derive equations for measurement of stresses across the cross section when subjected to external pressure.

Course Outcomes:

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

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

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

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

SYLLABUS:

UNIT – I: Simple Stresses And Strains: Elasticity and plasticity – Types of stresses and strains – Hooke's law – stress – strain diagram for mild steel – Working stress – Factor of safety – Lateral strain, Poisson's ratio and volumetric strain – Elastic moduli and the relationship between them – Bars of varying section – stresses in composite bars – Temperature stresses.
Strain Energy – Resilience – Gradual, sudden, impact and shock loadings – simple applications.

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

UNIT – III: Flexural and shear Stresses in beams
Flexural Stresses: Theory of simple bending – Assumptions – Derivation of bending equation: $M/I = f/y = E/R$, Neutral axis – Determination bending stresses – section modulus of rectangular and circular sections (Solid and Hollow), I, T, Angle and Channel sections – Design of simple beam sections.
Shear Stresses: Derivation of formula – Shear stress distribution across various beam sections like rectangular, circular, I, T Angle sections.

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

UNIT – V: Thin and Thick Cylinders:
Thin cylindrical shells – Derivation of formula for longitudinal and circumferential stresses – hoop, longitudinal and volumetric strains – changes in diameter, and volume of thin cylinders.
Thick cylinders: Introduction: Lames theory for thick cylinders, Derivation of Lames formulae, distribution of hoop and radial stresses across the thickness, compound cylinders-distribution of stresses.

TEXTBOOKS:
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.

II Year - I Semester		**L**	**T**	**P**	**C**
		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 analyze a variety of problems in fluid statics and dynamics.
2. Calculate the forces that act on submerged planes and curves.
3. Analyze various types of flow problems through closed conduits.
4. Measure the quantities of fluid flowing in pipes and channels.
5. Understand the concepts of Boundary layer and solve problems on boundary layer.

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

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

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

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

UNIT – III
Laminar Flow and Turbulent Flows: Reynold's experiment – Characteristics of Laminar & Turbulent flows, Shear and velocity distributions, Laws of Fluid friction, Hagen - Poiseulle Formula, Flow between parallel plates, Flow through long tubes, 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-William's formula, Hard-Cross Method,

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

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

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

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

II Year-I Semester		L	T	P	C
		3	0	0	3
STRUCTURAL ANALYSIS – I (PC2103)					

Course Learning Objectives:

➢ To give preliminary concepts of assessment of bending moment and shear force in Propped cantilevers, fixed beams, and continuous beams due to various loading conditions.

➢ To impart concepts of Bending Moment and Shear force for beams with different boundary and loading conditions.

➢ The procedure for development of slope deflection equations and to solve application to continuous beams with and without settlement of supports.

➢ The concepts of moving loads and influence lines are imparted for assessment of maximum SF and BM at a given section when loads of varying spans rolling loads of Pratt and Warren trusses.

Course Outcomes:

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

➢ Distinguish between the determinate and indeterminate structures.

➢ Identify the behaviour of structures due to the expected loads, including the moving loads, acting on the structure.

➢ Estimate the bending moment and shear forces in beams for different fixity conditions.

➢ Analyze the continuous beams using various methods, three moment method,slope deflection method, energy theorems.

➢ Draw the influence line diagrams for various types of moving loads on beams/bridges.

➢ Analyze the loads in Pratt and Warren trusses when loads of different types and spans are passing over the truss.

Syllabus:

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

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

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

UNIT-III: Propped Cantilevers: Analysis of propped cantilevers-shear force and Bending moment diagrams-Deflection of propped cantilevers.

 Fixed Beams – Introduction to statically indeterminate beams with U. D. load,central point load, eccentric point load, number of point loads, uniformly varying load,couple and combination of loads - shear force and Bending moment diagrams-Deflection offixed beams including effect of sinking of support, effect of rotation of a support.

UNIT – IV: Continuous Beams: Introduction-Clapeyron's theorem of three moments-Analysis of continuous beams with constant moment of inertia with one or both ends fixed continuous beams with overhang, continuous beams with different moment of inertia for different spans- Effects of sinking of supports-shear force and Bending moment diagrams.

Slope-Deflection Method: Introduction, derivation of slope deflection equation, application to continuous beams with and without settlement of supports.

UNIT – V: Energy Theorems: Introduction-Strain energy in linear elastic system, expressionof strain energy due to axial load, bending moment and shear forces - Castigliano's firsttheorem-Deflections of simple beams and pin jointed trusses.

Text Books:

1. Basic Structural Analysis, C. S. Reddy Tata Mc.Graw-Hill, New Delhi.
2. Analysis of Structures by T.S. Thandavamoorthy, Oxford University Press, New Delhi
3. Analysis of Structures- Vol. I and II, V. N. Vazirani and M. M. Ratwani, KhannaPublishers, New Delhi

References:

1. Theory of Structures, B. C Punmia, A. K Jain & Arun K. Jain, Lakshmi Publications
2. Theory of Structures, R.S. Khurmi, S. Chand Publishers.
3. Structural analysis by R.C. Hibbeler, Pearson, New Delhi.
4. Structural Analysis-I, Hemanth Patel, Yogesh Patel, Synergy Knowledgeware, Mumbai
5. Structural Analysis I Analysis of Statically Determinate Structures, P. N. Chandramouli,Yesdee Publishing Pvt Limited, Chennai.

II Year-I Semester		L	T	P	C
		3	0	0	3
CONCRETE TECHNOLOGY (PC2104)					

Course Learning Objectives:

- To learn concepts of Concrete production and behavior in various environments.
- To learn test procedures for determination of properties of concrete.
- To understand durability properties of concrete in various environments.

Course Outcomes:

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

- understand basic concepts of concrete.
- realize importance of quality of concrete.
- familiarize basic ingredients of concrete and their role in concrete and their behavior in the field.
- test fresh concrete properties and hardened concrete properties.
- evaluate ingredients of concrete through lab tests. design concrete mix by IS method.
- familiarize basic concepts of special concrete and their production and applications. understand the behavior of concrete in various environments.

UNIT I: Ingredients of Concrete:

Portland cement – Chemical composition – Hydration, setting times, Fineness, Structure – Tests on cement for physical properties – Grades of cements – Admixtures – Mineral and chemical admixtures – accelerators, retarders, air entrainers, plasticizers, super plasticizers, fly ash and silica fume.

Aggregates: Classification – Particle shape & texture – Bond, strength & other mechanical properties – Specific gravity, Bulk density, porosity, adsorption & moisture content – Bulking of sand –Deleterious substance – Soundness – Alkali aggregate reaction – Thermal properties – Sieve analysis – Fineness modulus – Grading curves – Grading of fine & coarse Aggregates – Gap graded and well graded aggregate as per relevant IS code – Maximum aggregate size. Quality of mixing water.

UNIT – II: Mix Design and Fresh Concrete

Mix Design: Factors affecting mix proportions – Durability of concrete – Quality Control of concrete – Statistical methods – Acceptance criteria – Concepts Proportioning of concrete mixes by IS method.

Fresh Concrete: Production of Concrete–mix proportion, mixing, placing, compaction, finishing, curing – including various types in each stage. Properties of fresh concrete - Workability – Factors affecting workability – Measurement of workability by different tests, setting times of concrete, Effect of time and temperature on 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 – strength of concrete –Maturity concept – Strength in tension & compression – Factors affecting strength – Relation between compression & tensile strength – Curing, Testing of Hardened Concrete: Compression tests – Tension tests – Factors affecting strength – Flexure tests –Splitting tests – Non-destructive testing methods – code provisions for NDT.

UNIT – IV: Elasticity, Creep & Shrinkage, Modulus of elasticity, Dynamic modulus of elasticity, Poisson's ratio, Creep of concrete and factors influencing creep, Relation between creep & time, Nature of creep, Effects of creep – Shrinkage –types of shrinkage.

UNIT – V: Special Concretes: Ready mixed concrete, Shotcrete, Light weight aggregate concrete, Cellular concrete, No-fines concrete, High density concrete, Fibre reinforced concrete, Different types of fibres, Factors affecting properties of FRC, Polymer concrete, Types of Polymer concrete, Properties of polymer concrete, High performance concrete–Self compacting concrete, SIFCON, self-healing concrete.

Textbooks:

Concrete Technology, M. S. Shetty. – S. Chand & Company

Concrete Technology, A. R. Santhakumar, Oxford University Press, NewDelhi

References:

Properties of Concrete, A. M. Neville – Pearson – 5thedition

Concrete, Microstructure, Properties and Materials by P.K.Mehta and
    Moterio, McGraw Hill

Concrete Technology, M.L. Gambhir. – Tata Mc. Graw Hill Publishers, NewDelhi

II Year-I Semester		L	T	P	C
		0	0	3	1.5
STRENGTH OF MATERIALS LAB (PC2105)					

Experiments

1. Tension test on Mild steel bar
2. Bending test on (Steel / Wood) Cantilever beam.
3. Bending test on simply supported beam.
4. Torsion test
5. Hardness test
6. Spring test
7. Compression test on wood or concrete
8. Impact test (Charpy and Izod impact test)
9. Shear test (on UTM)
10. Verification of Maxwell's Reciprocal theorem on beams.
11. Use of Electrical resistance strain gauges.
12. Continuous beam – deflection test.

List of Major Equipment:

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

II Year-I Semester		L	T	P	C
		1	0	2	2
BUILDING PLANNING AND DRAWING (PC2106)					

Objectives of the course:

- Initiating the student to different building bye-laws and regulations.
- Imparting the planning aspects of residential buildings and public buildings.
- Giving training exercises on various signs and bonds and different buildingunits.
- Imparting the skills and methods of planning of various buildings.

Course outcome:

- Upon successful completion of the course:
- Student should be able to plan various buildings as per the building by-laws.
- The student should be able to distinguish the relation between the plan, elevation and cross section and identify the form and functions among the buildings.
- The student is expected to learn the skills of drawing building elements and plan the buildings as per requirements.

SYLLABUS:

UNIT I: Building Byelaws and Regulations Introduction- terminology- objectives of building byelaws- floor area ratio- floor space index- principles under laying building bye laws- classification of buildings- open space requirements – built up area limitations- height of buildings- wall thickness – lightening and ventilation requirements.

UNIT II: Residential Buildings Minimum standards for various parts of buildings- requirements of different rooms and their grouping- characteristics of various types of residential buildings and relationship between plan, elevation and forms and functions

UNIT III: Public Buildings: Planning of educational institutions, hospitals, dispensaries, office buildings, banks, industrial buildings, hotels and motels, buildings for recreation, Landscaping requirements.

UNIT IV: Sign Conventions And Bonds: Brick, stone, plaster, sand filling, concrete, glass, steel, cast iron, copper alloys, aluminium alloys etc., lead, zinc, tin etc., earth, rock, timber and marbles.

English bond and Flemish bond - odd and even courses for one, one and half, two and two and half brick walls in thickness at the junction of a corner.

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

King Post truss, Queen Posttruss

Sloped and flat roof and buildings: drawing plans, Elevations and Cross Sections of givensloped and flat roof buildings

Planning And Designing Of Buildings:

Draw the Plan, Elevation and Sections of a Residential and Public buildings from thegiven line diagram.

TEXT BOOKS:

1. Planning, designing and Scheduling, Gurcharan Singh and Jagadish Singh
2. Building planning and drawing by M. Chakravarthy.
3. 3. 'A' Series & 'B' Series of JNTU Engineering College, Anantapur,

REFERENCES:

1. Building drawing, M G Shah, C M Kale and S Y Patki, Tata McGraw Hill, NewDelhi.
2. Principles of Building Drawing, M G Shah and C M Kale, Trinity Publications, NewDelhi.
3. Civil Engineering drawing and House planning, B. P. Verma, Khannapublishers, New

   Delhi.
4. Civil Engineering Building practice, Suraj Singh: CBS Publications, New Delhi, andChennaiI
5. Building Materials and Construction, G. C Saha and Joy Gopal Jana, McgrawHill Education (P) India Ltd. New Delhi.

INTERNAL EXAMINATION PATTERN:

The total internal marks (30) are distributed in two components asfollows:

1. Descriptive (subjective type) Weightage 60% examination:18 marks
2. Drawing Assignment   : 12 marks

FINAL EXAMINATION PATTERN:

The end examination paper should consist of Part A and Part B. Part A consist of five questions in planning portion out of which three questions are to be answered. Part B should consist of two questions from drawing part out of which one is to be answered in drawing sheet. Weight age for Part A is 60% and Part B is 40%.

II Year-I Semester		L	T	P	C
		0	0	3	2
CONCRETE TECHNOLOGY LAB (PC2107)					

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.

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Date: 23 March 2021

II Year - I Semester	SKILL ORIENTED COURSE	L	T	P	C
		1	0	3	2.5

II Year - I Semester		L	T	P	C
		0	0	3	1.5
BUILDING PLANNING AND COMPUTER AIDED ENGINEERING DRAWING (SC2101)					

Aim and Objective of this course

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

Course Outcomes (COs)

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

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

Week 1, 2 and 3

Concepts to be studied
Introduction to CAD software: Basic commands of CAD to draw, modify 2D drawings
Building Byelaws: Introduction – Terminology – Objectives of building byelaws – Principles under laying building bye laws – Types of Buildings.

Regulations: Introduction – Development Control Rules of buildings – General Building Requirements as per NBC – Open space, Lighting and ventilation requirements – Floor area ratio & Floor space index.

Conventions, signs and symbols: Conventions as per IS 962-1989, signs and symbols for earthwork,brickwork, stonework, concrete, woodwork and glass used in civil engineering.

Construction, Graphical symbols for door and window, Abbreviations, symbols for sanitary and electrical installations.

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

Types of scale- Monumental, Intimate, criteria for Proper Selection of scale for various types of drawing.

Sizes of various standard papers/sheets.

Exercise 0

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

Exercise 1

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

Week 4, 5 and 6

Concepts to be studied

Principles of building planning: Introduction to buildings, Classification of Buildings, Building Components, Orientation of building, Principles of architecture composition

Principles of planning of Residential and Public building, Orientation of building and Principles ofarchitecture composition: Aspect, Prospect Orientation, Grouping, Privacy, Elegance, Flexibility.Roominess, Circulation, Furniture requirements, Sanitation, Ventilation, Illumination and Economy. **Space requirements and bye-laws:** Space requirement and norms for minimum dimension ofdifferent units in the residential and public buildings as per IS 962-1989. Rules and bye-laws ofsanctioning authorities for construction work. Plot area, built up area, super built-up area, plinth area,carpet area, floor area and FAR (Floor Area Ratio) / FSI.

Exercise 2

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

Exercise 3

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

Week 7, 8, 9 and 10

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

Exercise 4

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

Exercise 5

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

Week 11, 12, 13 and 14

Concepts to be studied

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

Exercise 7

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

Exercise 8

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

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

SUGGESTED STUDENT ACTIVITIES

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

II Year-I Semester		L	T	P	C
COMPUTER AIDED ENGINEERING DRAWING (SC2102)					

Course Objective: To enhance the student's knowledge and skills in engineering drawing and to introduce drafting packages and commands for computer aided drawing and modeling.

UNIT-I:

Objective: The knowledge of projections of solids is essential in 3D modeling and animation. The student will be able to draw projections of solids. The objective is to enhance the skills they already acquired in their earlier course in drawing of projection.

PROJECTIONS OF SOLIDS: Projections of Regular Solids inclined to both planes – Auxiliary Views.

UNIT-II:
The knowledge of sections of solids and development of surfaces is required in designing and manufacturing of the objects. Whenever two or more solids combine, a definite curve is seen at their intersection.

SECTIONS OF SOLIDS: Sections and Sectional views of Right Regular Solids – Prism, Cylinder, Pyramid, Cone – Auxiliary views.

DEVELOPMENT AND INTERPENETRATION OF SOLIDS: Development of Surfaces of Right Regular Solids – Prism, Cylinder, Pyramid, Cone and their parts.

UNIT-III:

The intersection of solids also plays an important role in designing and manufacturing. The objective is to impart this knowledge through this topic. A perspective view provides a realistic 3D View of an object. The objective is to make the students learn the methods of Iso and Perspective views.

INTERPENETRATION OF RIGHT REGULAR SOLIDS: Intersection of Cylinder Vs Cylinder, Cylinder Vs Prism, Cylinder Vs Cone, Prism Vs Cone.

PERSPECTIVE PROJECTIONS: Perspective View: Points, Lines, Plane Figures and Simple Solids,
Vanishing Point Methods (General Method only).
In part B computer aided drafting is introduced.

UNIT IV:

The objective is to introduce various commands in AutoCAD to draw the geometric entities and to create 2D and 3D wire frame models.

INTRODUCTION TO COMPUTER AIDED DRAFTING: Generation of points, lines, curves, polygons, dimensioning. Types of modeling: object selection commands – edit, zoom, cross hatching, pattern filling, utility commands, 2D wire frame modeling, 3D wire frame modeling,

UNIT V:

By going through this topic, the student will be able to understand the paper-space environment thoroughly.

VIEWPOINTS AND VIEW PORTS: viewpoint coordinates and view(s) displayed, examples to exercise different options like save, restore, delete, joint, single option.

UNIT VI:

The objective is to make the students create geometrical model of simple solids and machine parts and display the same as an Isometric, Orthographic or Perspective projection.

COMPUTER AIDED SOLID MODELING: Isometric projections, orthographic projections of isometric projections, Modeling of simple solids, Modeling of Machines & Machine Parts.

TEXTBOOKS:

Engineering drawing by N.D Bhatt, Charotar publications.
Engineering Graphics, K.C. john, PHI Publications

REFERENCES:

Mastering Auto CAD 2013 and Auto CAD LT 2013 – George Omura, Sybex
Auto CAD 2013 fundamentals- Elisemoss, SDC Publ.
Engineering Drawing and Graphics using Auto Cad – T Jeyapoovan, vikas
Engineering Drawing + AutoCAD – K Venugopal, V. Prabhu Raja, New Age
Engineering Drawing – RK Dhawan, S Chand
Engineering Drawing – MB Shaw, BC Rana, Pearson
Engineering Drawing – KL Narayana, P Kannaiah, Scitech
Engineering Drawing – Agarwal and Agarwal, Mc Graw Hill
Engineering Graphics – PI Varghese, Mc Graw Hill
Text book of Engineering Drawing with auto-CAD, K.venkata reddy/B.S . publications.
Engineering Drawing with Auto CAD/ James D Bethune/Pearson Publications
Engineering Graphics with Auto CAD/Kulkarni D.M, Rastogi A.P, Sarkar A.K/PHI Publications

End Semester examination shall be conducted for **Four** hours with the following pattern:

Two hours – Conventional drawing
Two hours – Computer Aided Drawing

II Year

II Semester

II Year-II Semester		L	T	P	C
		3	**1**	**0**	**3**
PROBABILITY AND STATISTICS(BS2201)					

Course Objectives:
- To familiarize the complex variables.
- To familiarize the students with the foundations of probability and statistical methods.
- To equip the students to solve application problems in their disciplines.

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

UNIT – I: Functions of a complex variable and Complex integration:

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) – Evaluation of real integral of the type $\int_{-\infty}^{\infty} f(x)dx$

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, χ^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, Khanna Publishers.
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-II Semester		L	T	P	C
		3	**1**	**0**	**3**
	STRUCTURAL ANALYSIS – II (PC2201)				

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, Kani's 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.

TEXTBOOKS:
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
2. 'Theory of structures' by Ramamuratam, Dhanpatrai Publications.
3. 'Analysis of structures' by Vazrani & Ratwani – Khanna Publications.
4. 'Comprehensive Structural Analysis-Vol.I&2' by Dr. R. Vaidyanathan & Dr. P. Perumal- Laxmi Publications Pvt. Ltd., New Delhi

Date: 23 March, 2021

II Year-II Semester		**L**	**T**	**P**	**C**
		3		**0**	**3**
HYDRAULICS AND HYDRAULIC MACHINERY (PC2202)					

Course Learning Objectives:

➢ To study about uniform and non-uniform flows in open channels

➢ To introduce dimensional analysis for fluid flow problems

➢ To understand the working principles of various types of hydraulic machines and Pumps.

Course Outcomes:

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

➢ Solve uniform and non-uniform open channel flow problems.

➢ apply the principals of dimensional analysis and similitude in hydraulic model testing.

➢ Select suitable pumps and turbines.

Syllabus:

UNIT – I :

UNIFORM FLOW IN OPEN CHANNELS:

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

UNIT II :

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

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

UNIT – IV:

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

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

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

Text Books:

1. Open Channel flow, K. Subramanya, Tata McGraw Hill Publishers
2. Flow through Open channels by K.G. Ranga Raja, Tata Mc Graw Hill Publishers
3. Fluid Mechanics, and hydraulic machine, Rajput, S chand Publications.
4. Hydraulics and Fluid Mechanics including Hydraulic machinery By P.N. Modi, S.M Seth,Standard book house.

References:

1. Open channel hydraulics by Ven Te Chow. Mc Graw Hill Companies
2. Fluid Mechanics by V.L. Streeter,Mc Graw Hill Companies
3. Fluid Mechanics by K.L. Kumar, S.Chand punlications.

II Year-II Semester		L	T	P	C
		4	**0**	**0**	**3**
ENGINEERING GEOLOGY (ES2201)					

Course Learning Objectives:

The objective of this course is:

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

Course Outcomes:

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

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

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).

* * *

	MANAGERIAL ECONOMICS AND	L	T	P	C
II Year - II Semester	**FINANCIAL ANALYSIS (HS2201)** **(Common to all Branches)**	3	0	0	3

Course Objectives:

The Learning objectives of this paper are to understand the concept and nature of Managerial Economics and its relationship with other disciplines and also to understand the Concept of Demand and Demand forecasting.

To familiarize about the Production function, Input Output relationship, Cost-Output relationship and Cost-Volume-Profit Analysis.

To understand the nature of markets, Methods of Pricing in the different market structures and to know the different forms of Business organization and the concept of Business Cycles.

To learn different Accounting Systems, preparation of Financial Statement and uses of different tools for performance evaluation.

Finally, it is also to understand the concept of Capital, Capital Budgeting and the techniques used to evaluate Capital Budgeting proposals.

Course Outcomes:

The Learner is equipped with the knowledge of estimating the Demand and demand elasticities for a product.

The knowledge of understanding of the Input-Output-Cost relationships and estimation of the least cost combination of inputs.

The pupil is also ready to understand the nature of different markets and Price Output determination under various market conditions and also to have the knowledge of different Business Units.

The Learner is able to prepare Financial Statements and the usage of various Accounting tools for Analysis.

The Learner can able to evaluate various investment project proposals with the help of capital budgeting techniques for decision making.

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

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

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

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

Unit – V:
Capital and Capital Budgeting: Capital Budgeting: Meaning of Capital-Capitalization-Meaning of Capital Budgeting-Time value of money- Methods of appraising Project profitability: Traditional Methods(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)

TEXTBOOKS:
A R Aryasri, Managerial Economics and Financial Analysis, The McGraw – Hill companies.

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

II Year-II Semester		L	T	P	C
		0	0	3	2
SURVEYING FIELD WORK-II (PC2203)					

1. Theodolite survey: determining the horizontal and vertical angles by the method of repetition method.
2. Theodolite survey: finding the distance between two inaccessible points.
3. Theodolite survey: finding the height of far object.
4. Tacheometric survey: heights and distance problems using tacheometric principles.
5. One exercise on curve setting.
6. One exercise on contours.
7. Total station: introduction to total station and practicing setting up, levelling up and elimination of parallax error.
8. Total station: determination of area using total station.
9. Total station: traversing.
10. Total station: contouring.
11. Total station: determination of remote height.
12. Total station: distance between two inaccessible points.
       NOTE1: any 10 field work assignments must be completed.

II Year-II Semester		L	T	P	C
		0	0	2	1
	ENGINEERING GEOLOGY LAB (ES2202)				

Course Learning Objectives:

The objective of this course is:

- To identify the Megascopic types of Ore minerals & Rock forming minerals.
- To identify the Megascopic types of Igneous, Sedimentary, Metamorphic rocks.
- To identify the topography of the site & material selection.

Course Outcomes:

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

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

SYLLABUS:

LIST OF EXPERIMENTS

1. Physical properties of minerals: Mega-scopic identification of
   a. Rock forming minerals – Quartz group, Feldspar group, Garnet group, Mica group & Talc, Chlorite, Olivine, Kyanite, Asbestos, Tourmelene, Calcite, Gypsum, etc…
   b. Ore forming minerals – Magnetite, Hematite, Pyrite, Pyralusite, Graphite, Chromite, etc…

2. Megascopic description and identification of rocks.
   a) Igneous rocks – Types of Granite, Pegmatite, Gabbro, Dolerite, Syenite, Granite Poryphery, Basalt, etc.
   b) Sedimentary rocks – Sandstone, Ferrugineous sand stone, Lime stone, Shale, Laterite, Conglamorate, etc.
   c) Metamorphic rocks – Biotite – Granite Gneiss, Slate, Muscovite & Biotiteschist, Marble, Khondalite, etc.

3. Interpretation and drawing of sections for geological maps showing tilted beds, faults, unconformities etc.

4. Simple Structural Geology problems.

5. Bore hole data.

6. Strength of the rock using laboratory tests.

7. Field work – To identify Minerals, Rocks, Geomorphology & Structural Geology.

LAB EXAMINATION PATTERN:

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

REFERENCES:

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

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II Year-II		**L**	**T**	**P**	**C**
Semester		**0**	**0**	**3**	**1.5**
FLUID MECHANICS & HYDRAULIC MACHINERY LAB **(PC2204)**					

1. Verification of Bernoullis' equation.

2. Calibration of Venturimeter.

3. Calibration of orifice meter.

4. Determination of coefficient of discharge of a small orifice by constant head method

5. Determination of coefficient of discharge of an external cylindrical mouthpiece by variable head method.

6. Calibration of a contracted rectangular notch.

7. Calibration of a triangular notch.

8. Determination of friction factor of the pipe material.

9. Determination of coefficient of dead loss due to a sudden expansion/contraction in a pipeline.

10. Determination of head loss coefficient due to a bend in pipeline.

II Year – II Semester		**L**	**T**	**P**	**C**
		0	**0**	**3**	**1.5**
	SKILL ORIENTED COURSE (SC2201)				

III Year
I Semester

III Year-I Semester		L	T	P	C
		4	0	1	3
DESIGN AND DRAWING OF REINFORCED CONCRETE STRUCTURES (PC3101)					

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.

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%.

TEXTBOOKS:
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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Date: 23 March 2021

III Year-I Semester		L	T	P	C
		3	1	0	3
GEOTECHNICAL ENGINEERING – I (PC3102)					

Course Learning Objectives:

The objective of this course is:

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

Course Outcomes:

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

CO1: understand soil formation, its index properties and classification.

CO2: understand soil moisture and flow of water through soils and its effects.

CO3: understand stress distribution in soils.

CO4: understand Compressibility characteristics under partially saturated and fully saturated conditions.

CO5: understand shear strength of soil at different loading & drainage conditions for different soils.

SYLLABUS:

UNIT – I

Introduction: Soil formation – Structure of Soils – Texture of Soils – Three phase system and phase relationships.

Index Properties and Classification Tests of Soils: Index properties **–** Density Index **-** Grain size analysis – Sieve and Hydrometer methods – Consistency of Clay Soils – Activity of Clays – Thixotropy of clays - soil Classification – Unified soil classification and I.S. Soil classification.

UNIT – II

Soil moisture and Capillarity: Soil moisture and modes of occurrence – Total, Neutral and Effective Pressures – Capillary Rise in soils.

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

UNIT –III

Seepage and Flow Nets: Flow net for one-dimensional flow – two-dimensional flow – Basic equation for Seepage – Flow nets & Characteristics and Uses – Quicksand condition –Seepage forces

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

UNIT – IV

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

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

UNIT - V

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

TEXTBOOKS:

1. 'Soil Mechanics and Foundation Engineering by Dr. K.R. Arora, Standard Publishers and Distributors, New Delhi.
2. Basic and Applied Soil Mechanics' by Gopal Ranjan and A.S.R.Rao, New Age International Publishers.
3. 'Soil Mechanics and Foundation Engineering' by V.N.S.Murthy ,CBS publishers
4. 'Geotechnical Engineering' by C. Venkataramaiah, New Age International Publishers.

REFERENCES:

1. 'Fundamentals of Soil Mechanics' by D.W.Taylor., Wiley.
2. 'An introduction to Geotechnical Engineering' by Holtz and Kovacs; Prentice Hall
3. Principles of Geotechnical Engineering, BrajaM.Das, Cengage Learing.

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Date: 23rd March 2021

II Year – II Semester		L	T	P	C
		0	0	3	1.5

TRANSPORTATION ENGINEERING – I
(PC3103)

Course Learning Objectives:
The objectives of this course are:
- To impart different concepts in the field of Highway Engineering.
- To acquire design principles of Highway Geometrics and Pavements
- To acquire design principles of Intersections

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

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

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

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

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

UNIT – IV Highway Materials: Subgrade soil: classification –Group Index – Subgrade soil strength – California Bearing Ratio – Modulus of Subgrade Reaction. Stone aggregates: Desirable properties – Tests for Road Aggregates – Bituminous Materials: Types – Desirable properties – Tests on Bitumen – Bituminous paving mixes: Requirements – Marshall Method of Mix Design.

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

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

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

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

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

Professional Elective-I (PE3101)

III Year- II Semester		L	T	P	C
		0	0	3	2
GEOTECHNICAL ENGINEERING LAB (PC3104)					

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.

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Date: 23rd March, 2021

III Year-I Semester		L	T	P	C
		0	0	3	2
TRANSPORTATION ENGINEERING LAB (PC3105)					

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

TEXTBOOKS:

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.

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Open Elective-I (OE3101)

III B.Tech- Civil Engineering- ISemester

SKILL ADVANCED COURSES/SOFT SKILLS COURSES

III B.Tech- Civil Engineering- ISemester

SUMMER INTERNSHIP (SI3101)

III Year
II Semester

III Year-		**L**	**T**	**P**	**C**
II Semester		**4**	**0**	**1**	**3**
DESIGN AND DRAWING OF STEEL STRUCTURES (PC3201)					

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 – IS 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%.

TEXTBOOKS
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.

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Date: 23 March 2021

III Year- II Semester		L	T	P	C
		3	**1**	**0**	**3**
WATER RESOURCES ENGINEERING–I (PC3202)					

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

TEXTBOOKS:
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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Date: 23 March 2021

III Year- II Semester		L	T	P	C
		3	1	0	3
GEOTECHNICAL ENGINEERING – II (PC3203)					

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 analyze the shallow foundations.

CO5: Able to analyze 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.

TEXTBOOKS:

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.

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Date: 23rd March 2021

III Year-II Semester		L	T	P	C
		3	1	0	3
ENVIRONMENTAL ENGINEERING (PC3203)					

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

Course Outcomes:
Upon the successful completion of this course, the students will be able to:
a. Plan and design the water and distribution networks and sewerage systems
b. Identify the water source and select proper intake structure
c. Design & estimation of water supply system of an apartment

d. Select the appropriate appurtenances in the water supply
e. Selection of suitable treatment flow for raw water treatments

SYLLABUS:
UNIT–I
Introduction: Importance and Necessity of Protected Water Supply systems, Water borne diseases, Planning of public water supply system, components of public water supply systems. Per capita demand and factors influencing it, types of water demands and its variations, factors affecting water demand, Design Period, Factors affecting the Design period, estimation of water demand for a town or city, Population Forecasting.
UNIT-II
Sources of Water: Various surface and subsurface sources considered for water supply and their comparison-Capacity of storage reservoirs, Types of subsurface water bearing formations, Yields from wells and infiltration galleries. Conveyance of Water from the source to the point of interest: Gravity and Pressure conduits, Types of Pipes, Pipe Materials, selection of pipe materials, Pipe joints.
UNIT-III
Quality and Analysis of Water: Characteristics of water and their measurement or estimation or analysis: Physical, Chemical and Biological characteristics. Water quality criteria for different uses- Rural, Municipal, Industrial and Agricultural uses. Drinking water quality standards: IS and WHO guidelines.

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

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

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

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

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Professional Elective-II (PE3201)

Open Elective-II
(OE3201)

III Year-		L	T	P	C
II Semester		0	0	3	2
ENVIRONMENTAL ENGINEERING LAB (PC3204)					

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

Textbooks
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.

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Date: 11 February, 2018

III B.Tech- Civil Engineering- II Semester

SKILL ADVANCED COURSES/SOFT SKILLS COURSES

Soft Skills
Course

III B.Tech- Civil Engineering- II Semester

MANDATORY COURSES (MC3201)

III B.Tech- Civil Engineering- II Semester

INDUSTRIAL/ RESEARCH INTERNSHIP (MANDATORY 2 MONTHS)

IV Year
I Semester

IV Year – II Semester		**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**
PROGRAM ELECTIVE – III PRE-STRESSED CONCRETE (PE4101)					

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-I Semester		L	T	P	C
		3	**0**	**0**	**3**
WATER RESOURCES ENGINEERING–II (PE4102) (PE-IV)					

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. Analyze 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.

TEXTBOOKS:

1. 'Irrigation and Waterpower Engineering' by Punmia B C, P.B.B Lal, A.K. Jain and A.K. Jain (2009), Laxmi Publications Pvt. Ltd., New Delhi
2. 'Irrigation 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 Waterpower 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.

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Date: 23 March 2021

IV Year-I Semester		L	T	P	C
		3	0	0	3
REMOTE SENSING AND GIS (OE4101)(OE-III)					

Course Learning Objectives:
The course is designed to,
1. Introduce the basic principles of Remote Sensing and GIS techniques.
2. learn various types of sensors and platforms.
3. learn concepts of visual and digital image analysis.
4. understand the principles of spatial analysis.
5. appreciate application of RS and GIS to Civil Engineering

Course outcomes
At the end of the course the student will be able to
a. Be familiar with ground, air and satellite-based sensor platforms.
b. interpret the aerial photographs and satellite imageries.
c. create and input spatial data for GIS application.
d. apply RS and GIS concepts for application in Civil Engineering.

SYLLABUS:

UNIT – I
Introduction to Remote sensing: Basic concepts of remote sensing, electromagnetic radiation, electromagnetic spectrum, interaction with atmosphere, energy interaction with the earth surfaces, characteristics of remote sensing systems, types of resolutions - advantages & limitations
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,
Hydrology and Water Resources: Flood zoning and mapping, groundwater prospects, groundwater quality monitoring and potential recharge zones, watershed management.

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

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

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Date: 23 March 2021

IV Year-I Semester		L	T	P	C
		3	0	0	3
WASTE WATER TREATMENT (OE4102)(OE-IV)					

Course Learning Objectives:
The course will address the following:
    Enables the student to distinguish between the quality of domestic and industrial water requirements and wastewater quantity generation.
    To impart knowledge on selection of treatment methods for industrial wastewater.
    To know the common methods of treatment in different industries
    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:
    Know the quality and quantity of water for various industries and Advanced water treatment methods
    Learn the common methods of treatment of wastewaters and Biological treatment methods
    Study of methods to reduce impacts of disposal of wasters into environment and CETPs.
    Study of methods of treatment of wastewaters from specific industries like steel plants, refineries, and power plants, that imply biological treatment methods
    Study of methods of treatment of wastewaters from industries like Aqua, dairy, sugar plants, and distilleries that imply biological treatment methods

SYLLABUS:

UNIT – I
Industrial water Quantity and Quality requirements: Boiler, Cooling, Domestic/Canteen and Process waters for Textiles, Food processing, Dairy, Aqua industry, Sugar mills, Brewery and distillery Industries, Fertilizer industry, Power plants. Advanced water treatment - Adsorption, Reverse Osmosis, Ion Exchange, Ultra filtration, Freezing, elutriation, Removal of Iron and Manganese, Removal of Colour and Odour. Use of Municipal wastewater in Industries.

UNIT – II
Basic theories of Industrial Wastewater Management: Industrial waste survey - Measurement of industrial wastewater Flow-generation rates – Industrial wastewater sampling and preservation of samples for analysis - Wastewater characterization- Toxicity of industrial effluents- Common methods of Treatment of wastewaters - Unit operations and processes- Volume and Strength reduction –Neutralization – Equalization and proportioning- recycling, reuse and resources recovery. Miscellaneous Treatment: Biological treatment of sewage- Primary, secondary and Tertiary treatment of sewage.

UNIT – III

Industrial wastewater disposal management: Discharges into Sewers, Streams- Oxygen sag curve, Lakes-eutrophication and oceans and associated problems, Land treatment – sewage sickness, Common Effluent Treatment Plants: advantages and suitability, Limitations and challenges- Recirculation of Industrial Wastewaters- Effluent Disposal Method.
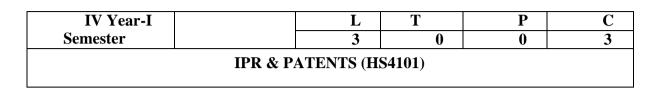
UNIT – IV

Process and Treatment of specific Industries-1: Manufacturing Process and origin, characteristics, effects and treatment methods of liquid waste from Steel plants, Fertilizers, Textiles, Paper and Pulp industries, Oil Refineries, Coal and Gas based Power Plants. Case studies.

UNIT – V

Process and Treatment of specific Industries-2: Manufacturing Process and origin, characteristics, effects and treatment methods of liquid waste from Tanneries, Sugar Mills, Distillers, Dairy and Food Processing industries, Aqua industry, Pharmaceutical Plants. Case studies.

TEXTBOOKS

1. Industrial Wastewater Treatment by KVSG Murali Krishna, Paramount Publishers, Visakhapatnam, 2019
2. Wastewater Treatment by M.N. Rao and A.K. Dutta, Oxford & IBH, NewDelhi.
3. Industrial Wastewater treatment by A.D. Patwardhan, PHI Learning,Delhi
4. Wastewater Treatment for Pollution Control and Reuse, by Soli. J Arceivala,
5. Shyam R Asolekar, Mc-Graw Hill, New Delhi; 3ʳᵈ Edition

REFERENCES

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

IV Year-I Semester		L	T	P	C
		3	0	0	3
	IPR & PATENTS (HS4101)				

SYLLABUS:
Unit I
Introduction to Intellectual Property Law – Evolutionary past – Intellectual Property Law Basics - Types of Intellectual Property - Innovations and Inventions of Trade related Intellectual Property Rights – Agencies Responsible for Intellectual Property Registration – Infringement - Regulatory – Over use or Misuse of Intellectual Property Rights - Compliance and Liability Issues.
Unit II
Introduction to Copyrights – Principles of Copyright – Subject Matters of Copyright – Rights Afforded by Copyright Law –Copyright Ownership – Transfer and Duration – Right to Prepare Derivative Works –Rights of Distribution – Rights of performers – Copyright Formalities and Registration – Limitations – Infringement of Copyright – International Copyright Law- Semiconductor Chip Protection Act.
Unit III
Introduction to Patent Law – Rights and Limitations – Rights under Patent Law – Patent Requirements – Ownership and Transfer – Patent Application Process and Granting of Patent – Patent Infringement and Litigation – International Patent Law – Double Patenting – Patent Searching – Patent Cooperation Treaty – New developments in Patent Law- Invention Developers and Promoters.
Unit IV
Introduction to Trade Mark – Trade Mark Registration Process – Post registration procedures – Trade Mark maintenance – Transfer of rights – Inter parties Proceedings – Infringement – Dilution of Ownership of Trade Mark – Likelihood of confusion – Trade Mark claims – Trade Marks Litigation – International Trade Mark Law
Unit V
Introduction to Trade Secrets – Maintaining Trade Secret – Physical Security – Employee Access Limitation – Employee Confidentiality Agreement – Trade Secret Law – Unfair Competition – Trade Secret Litigation – Breach of Contract – Applying State Law.
Unit VI
Introduction to Cyber Law – Information Technology Act - Cyber Crime and E-commerce – Data Security – Confidentiality – Privacy - International aspects of Computer and Online Crime.

REFERENCE BOOKS:

1. Deborah E.Bouchoux: "Intellectual Property". Cengage learning , New Delhi
2. Kompal Bansal & Parishit Bansal "Fundamentals of IPR for Engineers", BS Publications (Press)

3. Cyber Law. Texts & Cases, South-Western's Special Topics Collections
4. Prabhuddha Ganguli: ' Intellectual Property Rights" Tata Mc-Graw –
Hill, New Delhi
5. Richard Stim: "Intellectual Property", Cengage Learning, New Delhi.
6. R. Radha Krishnan, S. Balasubramanian: "Intellectual Property Rights",
Excel Books. New Delhi.
7. M.Ashok Kumar and Mohd.Iqbal Ali: "Intellectual Property Right"
Serials Pub.

IV Year-I Semester		L	T	P	C
		0	0	3	1.5
DESIGN AND DRAWING OF IRRIGATION STRUCTURES (PE4103)(PE-V)					

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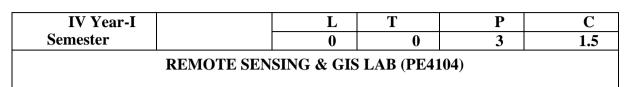
TEXT BOOKS:
1. Water Resources Engineering – Principles and Practice by C. Satyanarayana Murthy, New age International Publishers.

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.

Date: 23 March 2021

IV Year-I Semester		L	T	P	C
		0	0	3	1.5
	REMOTE SENSING & GIS LAB (PE4104)				

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

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

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Date: 10 February, 2018

IV B.Tech- Civil Engineering- I Semester
INDUSTRIAL AND RESEARCH INTERNSHIP (RI4101)

IV B.Tech- Civil Engineering- I Semester

SOFT SKILLS (SS41401)

IV Year -II Semester

IV Year – II Semester		**L**	**T**	**P**	**C**
		0	**0**	**0**	**12**
	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 engineering problem.

To enable the student capable for problem solving / problem shooting.

To instill and inculcate team spirit/ teamwork into the minds of the students.

To enable/ train the students report making/documentation.

· To provide students an opportunity to use any civil engineering software for their project work.

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 the Engineering problems.

Work together with team spirit.

Use Civil Engineering software at least ones.

Document the projects.