VISHNU INSTITUTE OF TECHNOLOGY: BHIMAVARAM
(AUTONOMOUS)
DEPARTMENT OF CIVIL ENGINEERING

Course Structure – R20
(With effect from 2020-2021)

I Year - I Semester

S.No.	Category	Course Title	L	T	P	C	IM	EM	TM
1	BSC	Mathematics – I (linear algebra and calculus)	3	-	-	3	30	70	100
2	BSC	Engineering Physics	3	-	-	3	30	70	100
3	HSMC	Communicative English	3	-	-	3	30	70	100
4	ESC	Engineering Graphics	2	-	2	3	30	70	100
5	ESC	Computational Thinking & Programming	3	-	-	3	30	70	100
6	HSMC LAB	English Communication Skills Laboratory	-	-	3	1.5	15	35	50
7	BSC LAB	Engineering Physics Laboratory	-	-	3	1.5	15	35	50
8	ESC LAB	Computational Thinking & Programming Laboratory	-	-	3	1.5	15	35	50
		Total	**14**	**0**	**11**	**19.5**	**195**	**455**	**650**

I Year - II Semester

S.No.	Category	Course Title	L	T	P	C	IM	EM	TM
1	BSC	Mathematics–II (vector & transform calculus)	3	-	-	3	30	70	100
2	BSC	Engineering Chemistry	3	-	-	3	30	70	100
3	ESC	Building Materials & Concrete Technology	3	-	-	3	30	70	100
4	ESC	Engineering Mechanics	3	-	-	3	30	70	100
5	ESC	Computer Programming	3	-	-	3	30	70	100
6	ESC LAB	Building Planning & Computer Aided Building Drawing Laboratory	-	-	3	1.5	15	35	50
7	BSC LAB	Engineering Chemistry Laboratory	-	-	3	1.5	15	35	50
8	ESC LAB	Engineering workshop Laboratory	-	-	3	1.5	15	35	50
9	MC	Environmental Science	2	-	-	-	-	-	-
		Total	**17**	**0**	**9**	**19.5**	**195**	**455**	**650**

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II Year - I Semester

S.No.	Category	Course Title	L	T	P	C	IM	EM	TM
1	BSC	Mathematics -III (Complex Variables and PDE)	3	-	-	3	30	70	100
2	PCC	Strength of Materials - I	3	-	-	3	30	70	100
3	PCC	Fluid Mechanics	3	-	-	3	30	70	100
4	PCC	Surveying	3	-	-	3	30	70	100
5	PCC	Highway Engineering	3	-	-	3	30	70	100
6	PCC LAB	Concrete Technology Laboratory	-	-	3	1.5	15	35	50
7	PCC LAB	Highway Engineering Laboratory	-	-	3	1.5	15	35	50
8	PCC LAB	Surveying Field Work (Laboratory)	-	-	3	1.5	15	35	50
9	SOC	Building & Earth Science Laboratory	-	-	4	2	15	35	50
10	MC	Constitution of India	2	-	-	-	-	-	-
Total			**17**	**0**	**13**	**21.5**	**21**	**490**	**700**

II Year - II Semester

S.No.	Category	Course Title	L	T	P	C	IM	EM	TM
1	BSC	M- IV	3	-	-	3	30	70	100
2	PCC	Strength of Materials –II	3	-	-	3	30	70	100
3	PCC	Hydraulics and Hydraulic Machinery	3	-	-	3	30	70	100
4	ESC/PCC	Environmental Engineering	3	-	-	3	30	70	100
5	HSMC	Understanding Harmony	3	-	-	3	30	70	100
6	ESC/ PCC LAB	Environmental Engineering Laboratory	-	-	3	1.5	15	35	50
7	PCC LAB	Strength of Materials Laboratory	-	-	3	1.5	15	35	50
8	PCC LAB	Fluid Mechanics & Hydraulics Machinery Laboratory	-	-	3	1.5	15	35	50
9	SOC	Advanced Construction Planning Laboratory	-	-	4	2	15	35	50
10	MC	Critical Reading and Creative Writing	2	-	-	-	-	-	-
Total			**17**	**0**	**13**	**21.5**	**210**	**490**	**700**
Internship 2 Months (Mandatory) during summer vacation									
Honors/Minor courses			**3**	**1**	**0**	**4**			

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III Year - I Semester

S.No.	Category	Course Title	L	T	P	C	IM	EM	TM
1	PCC	Structural Analysis	3	-	-	3	30	70	100
2	PCC	Geotechnical Engineering-I	3	-	-	3	30	70	100
3	PCC	Design & Drawing of Reinforced Concrete Structures	3	1	-	3	30	70	100
4	OEC/JOE-I	Elements of Civil Engineering / Advanced Concrete Technology	3	-	-	3	30	70	100
5	PEC-I	Air pollution And Control / Remote Sensing & GIS Applications / Traffic Engineering / Low Cost Housing	3	-	-	3	30	70	100
6	PCC LAB	Geotechnical Engineering Laboratory	-	-	3	1.5	15	35	50
7	PCC LAB	Remote Sensing & GIS Laboratory	-	-	3	1.5	15	35	50
8	SOC/SSC	Advanced English Communication Skills Laboratory	-	-	4	2	15	35	50
9	MC	Engineering Exploration Project	-	-	2	-	-	-	-
10		Summer Internship 2 months (To be completed after second year, and evaluated during V semester)	-	-	-	1.5	50	-	50
		Total	**15**	**01**	**12**	**21.5**	**245**	**455**	**700**

III Year - II Semester

S.No	Category	Course Title	L	T	P	C	IM	EM	TM
1	PCC	Design and Drawing of Steel Structures	3	1	-	3	30	70	100
2	PCC	Water Resource Engineering	3	-	-	3	30	70	100
3	PCC	Geotechnical Engineering-II	3	-	-	3	30	70	100
4	PEC-II	Architecture & Town Planning / Road Safety Engineering / Advanced Structural Analysis / Precast and Prefabricated structures	3	-	-	3	30	70	100
5	OEC/JOE-II	Basics of Environmental Engineering / Innovative Construction Materials	3	-	-	3	30	70	100
6	PCC LAB	Surveying Field Work- II (Laboratory)	-	-	3	1.5	15	35	50
7	PCC LAB	Estimation, Costing & Contracts Laboratory	-	-	3	1.5	15	35	50
8	PCC LAB	STAAD Pro Laboratory	-	-	3	1.5	15	35	50
9	SOC/SSC	Building Information Modeling (BIM) in Design Construction and Operations Laboratory	-	-	4	2	15	35	50
10	MC	Employability Skills for Civil Engineers	-	-	2	-	-	-	-
11		Industrial/Research Internship of 2 months (to be completed before III year)	-	-	-	-	-	-	-
		Total	**15**	**01**	**15**	**21.5**	**210**	**490**	**700**

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IV Year - I Semester

S.No.	Category	Course Title	L	T	P	C	IM	EM	TM
1	PEC-III	Pre-stressed Concrete Advanced Structural Engineering Urban Transportation And Planning Bridge Engineering	3	-	-	3	30	70	100
2	PEC-IV	Ground Improvement Techniques Geo-Spatial Technologies Reinforced Soil Structures Industrial Waste Water Treatment	3	-	-	3	30	70	100
3	PEC-V	Design & Drawing of Irrigation Structures Solid Waste Management Urban Hydrology Earth Retaining Structures	3	1 -	-	3	30	70	100
4	OEC/JOE-III	Repair & Rehabilitation of Structures Disaster Management & Mitigation	3	-	-	3	30	70	100
5	OEC/JOE-IV	Smart City Planning & Development Green Building Technologies	3	-	-	3	30	70	100
6	HSSE	Managerial Economics and Management Science Fundamentals of Entrepreneurship Business Environment	3	-	-	3	30	70	100
7	SOC	Computer Aided Project Management Laboratory	0	-	4	3	15	35	50
8		Industrial/Research Internship 2 months (after third year, to be evaluated after VII semester)	-	-	-	2	50	-	50
Total			**18**	**01**	**4**	**23**	**245**	**455**	**700**

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IV Year - II Semester

S.No	Category	Course Title	L	T	P	C	IM	EM	TM
1	Major Project	Project	-	-	-	12	100	100	200
		Project Work, Seminar & Internship in Industry (6 months)							
		Total	**0**	**0**	**0**	**12**	**100**	**100**	**200**

L – Lectures, T – Tutorials, P – Practicals, C – Credits, IM – Internal Marks, EM – External Marks, TM – Total Marks, BS- Basic Science Course, HSS- Humanities & social sciences ,ES-Engineering Science course , MC-Mandatory Course , PC-Professional core course, SOC-Skill Oriented course , OE/JOE-Open Elective/Job oriented Elective , PE- Professional Elective , HSSE- Humanities & Social Science Elective

S.No.	Semester	No of Credits	Academic year	No of Credits	Total credits
1	I-I	19.5	I year	39	160
2	I-II	19.5			
3	II-I	21.5	II year	43	
4	II-II	21.5			
5	III-I	21.5	III year	43	
6	III-II	21.5			
7	IV-I	23	IV year	35	
8	IV-II	12			

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I Year - I Semester

S.No.	Category	Course Title	L	T	P	C	IM	EM	TM
1	BSC	Mathematics-I (Linear Algebra & Calculus)	3	-	-	3	30	70	100
2	BSC	Engineering Physics	3	-	-	3	30	70	100
3	HSMC	Communicative English	3	-	-	3	30	70	100
4	ESC	Engineering Graphics	2	-	2	3	30	70	100
5	ESC	Computational Thinking &Programming	3	-	-	3	30	70	100
6	HSMC lab	English Communication Skills Lab	-	-	3	1.5	15	35	50
7	BSC lab	Engineering Physics Lab	-	-	3	1.5	15	35	50
8	ESC lab	Computational Thinking & Programming Lab	-	-	3	1.5	15	35	50
Total			**14**	**0**	**11**	**19.5**	**195**	**455**	**650**

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Subject	MATHEMATICS-I (LINEAR ALGEBRA & CALCULUS)				
Year/semester	I B.Tech / I Sem	L	T	P	C
Regulation year	R - 20	3	0	0	3

Course Objectives:

To enable the students to

1. Know the importance of matrices to solve linear equations using matrices.
2. Identify and solve various differential equations using corresponding methods.
3. Apply methods of solving higher order linear differential equations.
4. Comprehend the theory of maxima and minima of a function of two variables.
5. Analyze the techniques of tracing the curves and evaluate the lengths, areas, volumes of objects using multiple integrals

Course Outcomes:

After completing this course, the students will be able to

1. Solve linear system of equations in engineering problems.
2. Find Eigen-values and Eigen vectors of a matrix in engineering studies.
3. Model engineering problems as differential equations and solve analytically.
4. Find out local /global optimum of functions of several variables.
5. Compute areas and volumes by integrals

SYLLABUS

UNIT – I

Matrices - Linear system of equations: Introduction, Different types of matrices, Rank-Echelon form - Normal form, Solution of a System of Linear Equations – Non-homogeneous and homogeneous equations, Gauss- Jordan method, Gauss – Elimination Method, LU Decomposition, Applications of electric circuits.

UNIT - II

Eigen values - Eigen vectors: Eigen values - Eigen vectors – Properties– Cayley-Hamilton Theorem - finding inverse and power of a matrix by using Cayley-Hamilton theorem,

Diagonalization of matrices, Spectral Decomposition, Singular Value Decomposition and Principal Component Analysis.

UNIT – III

Differential Equations: Differential equations of first order and first degree–Exact and Non–exact differential equations, Linear and Bernoulli differential equations. Orthogonal trajectories, Newton's Law of cooling, Law of natural growth and decay, Higher order homogenous and non - homogenous linear differential equations with constant coefficients - Particular integrals for the functions of type e^{ax}, sin(ax+b), cos(ax+b), Polynomial of x , e^{ax} V(x), L-C-R Circuits.

UNIT – IV

Partial Differentiation: Functions of several variables- Partial derivatives, Total derivative, Chain rule, Change of variables, Jacobians, Functional dependence. Generalized Mean Value theorem –Taylor's theorem and Maclaurin's theorem (without proof) for a function of two variables, Maxima and Minima of functions of two variables, Lagrange's method of undetermined multipliers.

UNIT – V

Multiple Integrals and Applications: Review of Curve tracing-Cartesian-Polar and Parametric curves.

Multiple integrals - double integrals - change of variables (Cartesian and Polar coordinates), Change of order of integration and Evaluation of triple integrals, computing area and volume.

Text Books:

1. B. S. Grewal, Higher Engineering Mathematics, 42nd Ed., Khanna Publishers, New Delhi, 2012.
2. Erwin .Kreyszig, Advanced Engineering Mathematics,9th Ed., Wiley, 2012

References:

1. T.K.V. Iyengar, B. Krishna Ghandhi, S. Ranganathan and M.V.S.S.N. Prasad, Engineering Mathematics, Volume-I, 12th Ed., S. Chand Publishers, 2014.
2. B. V. Ramana, Engineering Mathematics, 4th Ed., Tata McGraw Hill, New Delhi, 2009.
3. D. S. Chandrashekharaiah, Engineering Mathematics, Volume 1, Prism Publishers, 2010.
4. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, reprint, 2008.

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Subject	ENGINEERING PHYSICS				
Year/semester	I B.Tech / I Sem	L	T	P	C
Regulation year	R - 20	3	0	0	3

Course Objectives:

1. To identify the importance of the optical phenomenon i.e. interference, diffraction and polarization related to its Engineering applications.
2. Understand the mechanism of emission of light, utilization 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.
3. To explain the significant concepts of dielectric and magnetic materials that leads to potential applications in the emerging micro devices.
4. 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.
5. Enlighten the periodic arrangement of atoms in Crystalline solids by Bragg's law – Learning the structural analysis through X-ray diffraction.

Course Outcomes:

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

1. Explain the need of coherent sources and the conditions for sustained interference. Identify the applications of interference in engineering. Analyze the differences between interference and diffraction with applications. Illustrate the concept of polarization of light and its applications.
2. Explain various types of emission of radiation. Identify the role of laser in engineering applications. Describe the construction and working principles of various types of lasers. Explain the working principle of optical fibers. Classify optical fibers based on refractive index profile and mode of propagation. Identify the applications of optical.
3. Explain the concept of dielectric constant and polarization in dielectric materials. Summarize various types of polarization of dielectrics. Classify the magnetic materials based on susceptibility and their temperature dependence. Explain the applications of dielectric and magnetic materials. Apply the concept of magnetism to magnetic devices.

4. Explain sound waves and its propagation/absorption of construction material used in design of buildings. Analyze acoustic parameters of typical materials used in buildings. Recognize sound level disruptors and their application in architectural acoustics. Identify the use of ultrasonics in diversified fields of NDT.
5. Interpret various crystal systems and analyze the characterization of materials by XRD. Identify the important properties of crystals like the presence of long-range order and periodicity, structure determination using X-ray diffraction technique. Analysis of structure of the crystals by Laue and Powder techniques.

SYLLABUS

UNIT - I

WAVE OPTICS

Interference: Introduction - Principle of Superposition-Coherence-Conditions for Sustained Interference -Interference in thin films (reflected Geometry)-Newton's Rings-Determination of Wavelength and Refractive Index-Applications of Interference.

Diffraction: Introduction- Fresnel and Fraunhofer diffraction-Fraunhofer Diffraction due to Single slit, double slit –N – slits (Qualitative)-Diffraction Grating -Determination of Wavelength-Applications of Diffraction.

Polarization: Introduction- types of polarized light, Polarization by reflection, refraction and double refraction- Nicol's prism-Half wave and Quarter wave plates.

UNIT - II

LASERS & FIBER OPTICS

Lasers: Introduction-Characteristics of Laser–Spontaneous and Stimulated emissions of radiation-Einstein's coefficients & Relation between them and their significance – population inversion - Ruby laser – Helium Neon laser –Semiconductor diode laser(Qualitative)-Applications of Lasers.

Fiber Optics: Introduction to Optical Fibers-Total Internal Reflection- Construction of optical fibers -Acceptance angle-Numerical Aperture-Classification of fibers based on Refractive index profile, modes - Propagation of electromagnetic wave through optical fiber -Block Diagram of Fiber optic Communication- Applications of optical fibers.

UNIT - III

MAGNETIC MATERIALS AND DIELECTRIC PROPERTIES

Magnetic Materials: Introduction - Magnetic dipole moment – Magnetization - Magnetic susceptibility and permeability - Origin of permanent magnetic moment - Classification of Magnetic materials - Weiss theory of ferromagnetism (qualitative) – Hysteresis - soft and hard magnetic materials - Magnetic device applications.

Dielectrics: Introduction to Dielectrics - Electric polarization - Dielectric polarizability, Susceptibility and Dielectric constant - Types of polarizations with derivations for polarisabilities (Qualitative) – Lorentz (internal) field - Claussius - Mosotti equation.

UNIT - IV

ACOUSTICS AND ULTRASONICS

Acoustics: Introduction – Reverberation - Reverberation time -Classification of Sound waves-Weber–Fechner law - Sabine's formula- derivation using growth and decay method – Absorption coefficient and its determination –factors affecting acoustics of buildings and their remedies.

Ultrasonics: Introduction -Production of ultrasonics by Magnetostriction and piezoelectric methods - Detection of ultrasonics -acoustic grating -Non Destructive Testing – pulse echo system through transmission and reflection modes - applications

UNIT - V

CRYSTALLOGRAPHY AND X-RAY DIFFRACTION

Crystallography: Introduction-Space lattice, Basis, Unit Cell and Lattice Parameters-, Bravais lattices,-Crystal Systems (3D)-coordination number-Packing fraction of SC, BCC and FCC structures.

X-ray Diffraction: Introduction - Miller indices-Separation between successive (hkl) planes. Bragg's Law-X-ray Diffractometer-Crystal Structure determination by Laue's and Powder Mehods (Qualitative).

Text books:

1. M.N. Avadhanulu, P.G.Kshirsagar "A Text book of Engineering Physics"-S.Chand Publications,2017**.**
2. H.K.Malik & A.K.Singh "Engineering Physics",- McGraw Hill Publishing Company Ltd, 2018.

3. P.K. Palanisamy, Applied Physics, SciTech Publications.

Reference Books:

1. Gerd Keiser “Optical Fiber Communications”- 4/e, Tata Mc GrawHill ,2008
2. Charles Kittel “Introduction to Solid State Physics”,Wiley Publications,2011
3. S.M.Sze “Semiconductor devices-Physics and Technology”-Wiley,2008
4. Halliday, Resnick and Walker, “Fundamentals of Physics”, John WileySons.
5. M.R. Srinivasan, Engineering Physics, NewAge International Publishers.

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Subject	COMMUNICATIVE ENGLISH				
Year/semester	I B.Tech / I Sem	L	T	P	C
Regulation year	R - 20	3	0	0	3

SYLLABUS

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:

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

Course Outcomes

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

1. Appreciate a piece of prose; employ suitable strategies for skimming and scanning to get the general idea of a text; recognize paragraph structure and formulate

sentences using proper grammatical structures and correct word forms of nouns and pronouns and GRE Words.

2. Study a piece of prose; write well structured paragraphs and understand applying cohesive devices and use articles and prepositions accurately and learn good vocabulary.
3. Analyze a text in detail and summarize and employ verbs, tenses and subject verb agreement appropriately; apply vocabulary and word associations.
4. Understand a text, and learn and apply information transfer and apply the use of adjectives and adverbs and vocabulary.
5. Interpret ideas from reading comprehension and write formal letters and emails, use voice and reported speech properly and edit short texts by correcting common errors and learn vocabulary

Methodology:

1. The classes are to be learner-centered where the learners are to read the texts to get a comprehensive idea of those texts on their own with the help of the peer group and the teacher.
2. Integrated skill development methodology has to be adopted with focus on individual language skills as per the tasks/exercise.
3. The tasks/exercises at the end of each unit should be completed by the learners only and the teacher intervention is permitted as per the complexity of the task/exercise.
4. The teacher is expected to use supplementary material wherever necessary and also generate activities/tasks as per the requirement.
5. The teacher is permitted to use lecture method when a completely new concept is introduced in the class.

(R-20 Regulations)
Detailed Textbook:
Infotech English by Maruthi Publications

Non-Detailed Textbook:
Wings of Fire: APJ Abdul Kalam by University Press

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UNIT - I

Detailed: A Drawer Full of Happiness
Non-detailed: APJ Abdul Kalam's Wings of Fire 1-5 Chapters
Reading: Skimming text to get the main idea. Scanning to look for specific pieces of information.
Reading for Writing: Beginnings and endings of paragraphs - introducing the topic, summarizing the main idea and/or providing a transition to the next paragraph.
Writing: Writing **S**entences with proper word order - Basic Sentence Structures.
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, pronouns, basic sentence structures; simple question form - wh-questions; word order in sentences.

UNIT - II

Detailed: Nehru's letter to his daughter Indira on her birthday
Non-detailed: APJ Abdul Kalam's Wings of Fire 6-10 Chapters
Reading: Identifying sequence of ideas; recognizing verbal techniques that help to link the ideas in a paragraph together.
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 words). GRE Vocabulary Analogies (20 words) Antonyms and Synonyms, Word applications
Grammar: Use of articles and zero article; prepositions.

UNIT – III

Detailed: Stephen Hawking-Positivity 'Benchmark'
Non-detailed: APJ Abdul Kalam's Wings of Fire 10-15 Chapters
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.
Vocabulary: Technical vocabulary from across technical branches (20 words). GRE Vocabulary (20 words) Antonyms and Synonyms, Word applications, Association
Grammar: Verbs - tenses; Subject-verb agreement.

UNIT - IV

Detailed: Liking a Tree, Unbowed: Wangari Maathai's Biography
Non-detailed: APJ Abdul Kalam's Wings of Fire 16-20 Chapters
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.
Vocabulary: Technical vocabulary from across technical branches (20 words) GRE Vocabulary (20 words) Antonyms and Synonyms, Word applications
Grammar: Quantifying expressions - adjectives and adverbs; comparing and contrasting; degrees of comparison.

UNIT – V

Detailed: Stay Hungry-Stay foolish from "Infotech English", Maruthi Publications.
Non-detailed: APJ Abdul Kalam's Wings of Fire 21-24 Chapters by University Press
Reading: Reading for comprehension. RAP Strategy Intensive reading and Extensive reading techniques.
Reading for Writing: Letter writing, E mail writing, email etiquette.
Vocabulary: Technical vocabulary from across technical branches (20 words) GRE Vocabulary (20 words) Antonyms and Synonyms, Word applications.
Grammar: Direct and indirect speech, reporting verbs for academic purposes, Active Voice-Passive Voice; editing short texts – identifying and correcting common errors in grammar and usage (articles, prepositions, tenses, subject verb agreement and conjunctions)

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.

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Sample Web Resources

Grammar/Listening/Writing

1-language.com

http://www.5minuteenglish.com/

https://www.englishpractice.com/

Grammar/Vocabulary

English Language Learning Online

http://www.bbc.co.uk/learningenglish/

http://www.better-english.com/

http://www.nonstopenglish.com/

https://www.vocabulary.com/

BBC Vocabulary Games

Free Rice Vocabulary Game

Reading

https://www.usingenglish.com/comprehension/

https://www.englishclub.com/reading/short-stories.htm

https://www.english-online.at/

Listening

https://learningenglish.voanews.com/z/3613

http://www.englishmedialab.com/listening.html

Speaking

https://www.talkenglish.com/

BBC Learning English – Pronunciation tips

Merriam-Webster – Perfect pronunciation Exercises

All Skills

https://www.englishclub.com/

http://www.world-english.org/

http://learnenglish.britishcouncil.org/

Online Dictionaries

Cambridge dictionary online

MacMillan dictionary

Oxford learner's dictionaries

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Subject	ENGINEERING GRAPHICS				
Year/semester	I B.Tech / I Sem	L	T	P	C
Regulation year	R - 20	2	0	2	3

Course Objectives:

1. To introduce the students to use drawing instruments and to draw polygons, Engg. Curves and use scales.
2. To introduce the students orthographic projections, projections of points & lines.
3. The objective is to make the students draw the projections of the plane inclined to both the planes.
4. 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.
5. 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.

Course Outcomes:

Students will be able to:

1. Construct engineering curves and scales.
2. Understand orthographic projections, projections of points & lines.
3. Draw the projections of a plane inclined to both the planes.
4. Draw the projections of various types of solids in different positions inclined to one or both the planes.
5. Visualize and convert the isometric view to orthographic view and vice versa.

SYLLABUS

UNIT - I

Introduction to Graphics

Curves: Ellipse, Parabola and Hyperbola by general methods, Tangent & Normal, Cycloids, Involutes, tangent & normal for the curves.

Scales: Plain scale, Diagonal scale and Vernier scale.

UNIT - II

Orthographic Projections: Introduction to Projections, Horizontal plane, Vertical plane, Profile plane, importance of reference lines.

Projections of points in various quadrants.

Projections of straight lines inclined to one plane, inclined to both the planes, traces.

UNIT - III

Projections of planes: inclined to one reference plane; inclined to both the reference planes.

UNIT - IV

Projections of Solids – Projections of Prisms, Pyramids, Cones and Cylinders simple positions, the axis inclined to one of the reference planes and axis inclined to both the reference planes.

UNIT - V

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

Text books:

1. Engineering Drawing by N.D. Bhatt, Charotar Publishing House Pvt. Ltd
2. Engineering Drawing by Agarwal & Agarwal, Tata McGraw Hill

Reference books:

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

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Subject	COMPUTATIONAL THINKING &PROGRAMMING				
Year/semester	I B.Tech / I Sem	L	T	P	C
Regulation year	R - 20	3	0	0	3

Course Objectives:

1. To teach problem solving through Algorithms and Flowcharts
2. To elucidate problem solving through Python programming language
3. To train in the development of solutions using modular concepts
4. To explain the role of data structures in programming
5. To introduce object oriented programming paradigm through Python

Course Outcomes:

Student should be able to

1. Understand the working principles of various components of a computer.
2. Develop computational thinking and be able to use Python constructs to solve basic problems.
3. Understand modularization and data structures concepts in Python.
4. Apply file handling concepts in problem solving.
5. Solve Real world problems by applying Object Oriented Concepts

SYLLABUS

UNIT – I

Knowing the Computer: Definition and Block Diagram of a Computer. Basic parts of a computer (Memory, CPU, Input, and Output), Memory hierarchy, Circuits and Logic, Hardware vs Software, Representation of Data in memory (integer (including negative), floating points etc. to text, images, audio and video), Principle of Abstraction, Operating System, Language Hierarchy - Machine Language to High Level Language, Compiler, Interpreter, The Command Line Interface (basic Linux commands)

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UNIT – II

Computational Thinking and Introduction to Python: Simple logic building through flowcharting. Flowchart symbols, conditional and repetition blocks.

Computational Thinking, Algorithm, Pseudocode, Time/Space complexity. Only Big O notation.

Basic structure of a Python program, Elements of Python programming Language: token, literals, identifiers, keywords, expression, type conversions, Numbers, Variables, Input/Output statements, basic data types. Operators and their types and precedence, expressions. Control structures in Python - conditionals and loops

UNIT – III

Python Data Structures and Modularization: List and List Operations, Using Lists to represent Matrices, Strings, String operations, Tuples, Dictionaries, Sets, Iterators and generators, comprehensions.

Basic math functions, User defined Functions, parameters to functions, positional, keyword and default arguments, Lambda Functions, recursion. Packages, modules and name spaces.

UNIT - IV

File Handling: Files, Types of Files, Creating and Reading Text Data, File Methods to Read and Write Data, Reading and Writing Binary Files, The Pickle Module, Reading and Writing CSV Files, Python os and os.path Modules

UNIT – V

Object Oriented Programming: Object Oriented Design. Classes and Objects. Polymorphism, Abstraction, Inheritance, Encapsulation. Constructors. Function and operator overloading. Exception Handling.

Text Book:

1. Think Python: How to Think Like a Computer Scientist , Allen B. Downey, 2nd Edition (https://www.greenteapress.com/thinkpython/thinkCSpy.pdf)

Reference Books:

1. Core python programming, W Chun PHI (http://emixam.sevla.free.fr/books/2.PythoProg_softarchive.net.pdf)
2. Python programming a modern approach, Vamsi Kurama, pearson

Web Resources:

1. http://www.ict.ru.ac.za/Resources/cspw/thinkcspy3/thinkcspy3.pdf
2. https://snakify.org

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Subject	ENGLISH COMMUNICATION SKILLS LAB				
Year/semester	I B.Tech / I Sem	L	T	P	C
Regulation year	R - 20	0	0	3	1.5

Course Objectives:

1. To sensitize the student's nuances of English speech sounds.
2. To bring about a consistent accent and intelligibility in students'pronunciation of English by providing an opportunity for practice in speaking.
3. To improve the fluency in spoken English in different contexts.
4. To demonstrate the synchronization of verbal and non verbal communication.
5. To speak with clarity and confidence.
6. To enrich the persuasive skills.

COURSE OUTCOMES

The students will be able to:

1. Understand Non Verbal Communication and Identify the topic, the context, specific questions and overall idea by listening to short audio texts and answering a series of questions and will also be able to introducing themselves and others.
2. Articulate Vowels and Consonants properly and answer a series of questions about main idea and supporting ideas after listening to audio texts and will be able to use expressions for Greetings and Leave takings, Complaining and Apologizing.
3. Understand stress and listen for global comprehension and summarize what is listened to and will be able to use expressions for Permissions, Requesting, Inviting.
4. Apply the rules of stress and intonation while reading a text; will be able to speak on short topics and will also be able to use expressions for Asking for and giving Information/Directions; Suggesting/Opinion giving.
5. Write and enact Dialogues/Role Plays and practice topics from Science and Technology - using PPT slides and neutralize accent

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MODULE – I

Listening: Listening to short audio texts and identifying the topic, 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 introduction and introducing others.

Non Verbal Communication

Pronunciation: Introduction to Phonetics-Sounds of English-Phoneme

MODULE – II

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

Functional English: Greetings and leave taking, Complaining and Apologizing.

Pronunciation: Vowels and Consonants**,** Past tense markers, Plural markers

MODULE – III

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

Functional English: Permissions, Requesting, Inviting.

Pronunciation: Syllable, Word Stress: Weak and Strong forms, Stress in compound words, Contrastive Stress

MODULE – IV

Speaking: Just a Minute **(**JAM)

Functional English Asking for and giving Information/Directions; Suggesting/Opinion giving.

Pronunciation: Rhythm & Intonation

MODULE – V

Functional English: Dialogues/Role Plays

Speaking: Formal oral presentations on topics from Science and Technology - with the use of PPT slides.

Pronunciation: Accent Neutralization

Infrastructure:

1. 60 computer systems for a class of 60 students.
2. LAN facility and English Language Software for self-study by learners.
3. Audio System
4. Projector

System Requirement: Hardware Component

5. P – IV Processor
6. Speed – 2.8 GHZ
7. RAM – 512 MB minimum
8. Hard Disk – 80 GB
9. Headphones of high quality

Suggested Software:

1. Cambridge Advanced Learners‘ English Dictionary with CD.
2. Grammar Made Easy by Darling Kindersley
3. Punctuation Made Easy by Darling Kindersley
4. Clarity Pronunciation Power – Part I
5. Clarity Pronunciation Power – part II
6. Oxford Advanced Learner‘s Compass, 7th Edition
7. DELTA‘s key to the Next Generation TOEFL Test: Advanced Skill Practice.
8. MELL - K Van Solutions Software
9. TOEFL & GRE (KAPLAN, AARCO & BARRONS, USA, Cracking GRE by CLIFFS)
10. English in Mind (Series 1-4), Herbert Puchta and Jeff Stranks with Meredith Levy, Cambridge
11. English Pronunciation in Use, Cambridge University Press
12. Technical Communication, OUP
13. Communication Skills, OUP

Suggested reading:

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.

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Subject	ENGINEERING PHYSICS LAB				
Year/semester	I B.Tech / I Sem	L	T	P	C
Regulation year	R - 20	0	0	3	1.5

List of Experiments:

1. Determination of wavelength of a source-Diffraction Grating-Normal incidence
2. Newton's rings –Radius of Curvature of Plano Convex Lens.
3. Determination of thickness of a thin object using parallel interference fringes.
4. Determination/ of Rigidity modulus of a material- Torsional Pendulum.
5. Determination of Acceleration due to Gravity and Radius of Gyration- Compound Pendulum.
6. Melde's experiment – Transverse and Longitudinal modes.
7. Verification of laws of stretched string – Sonometer.
8. Determination of velocity of sound – Volume resonator.
9. L C R Series Resonance Circuit
10. Study of I/V Characteristics of Semiconductor diode
11. I/V characteristics of Zener diode
12. Thermistor characteristics – Temperature Coefficient
13. Magnetic field along the axis of a current carrying coil – Stewart and Gee's apparatus.
14. Energy Band gap of a Semiconductor p.n junction.
15. Hall Effect for semiconductor.

Conduct 10 out of 15 experiments

Reference:

1. Engineering Physics Lab Manual by Dr.Y. Aparna & Dr.K.Venkateswarao (V.G.S.Book links)
2. Physics Practical Manual, Lorven Publication

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Subject	COMPUTATIONAL THINKING & PROGRAMMING LAB				
Year/semester	I B.Tech / I Sem	L	T	P	C
Regulation year	R - 20	0	0	3	1.5

Course Objectives:

1. Get acquainted with fundamentals of writing **Python** scripts.
2. Master core **Python** scripting elements by solving more number of problems
3. Able to identify right data structure to solve the problem
4. Design **Python** functions to facilitate code reuse.
5. Gaining familiarity in Python file I/O

Week 1 - 3

- Design algorithms and flowcharts for given problems
- Python programs on decision and loop control statements
  - Whether the given number is even or odd
  - Maximum of three numbers
  - Sum of digits, Palindrome
  - Factorial of a number,
  - GCD of given numbers
  - Sum of first n natural numbers
  - Evaluate Cosine and Sine Series etc.

Week 4 - 6

- Exercise programs on lists and functions
  - Finding the sum and average of given numbers using lists.
  - To display elements of list in reverse order.
  - Finding the minimum and maximum elements in the lists.
  - Using functions to calculate power, factorial etc
  - Passing lists as function arguments
  - Call by value and call by referece
  - Recursion

Week 7 - 9

- Exercise programs on Strings.
  - Palendrome Checking
  - Count the number of characters, number of vowels etc in the given line of textetc
- Exercise programs on Tuples, Dictionaries

Week 10 - 12

- Exercise programs on file handling
- Exercise programs on regular expressions
- Exercise programs on exception handling

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Course Structure – R20
(With effect from 2020-2021)

I Year - II Semester

S.No.	Category	Course Title	L	T	P	C	IM	EM	TM
1	BSC	Mathematics–II (vector & transform calculus)	3	-	-	3	30	70	100
2	BSC	Engineering Chemistry	3	-	-	3	30	70	100
3	ESC	Building Materials &Concrete Technology	3	-	-	3	30	70	100
4	ESC	Engineering Mechanics	3	-	-	3	30	70	100
5	ESC	Computer Programming	3	-	-	3	30	70	100
6	ESC LAB	Building planning & Computer Aided Building Drawing	-	-	3	1.5	15	35	50
7	BSC LAB	Engineering Chemistry Lab	-	-	3	1.5	15	35	50
8	ESC LAB	Engineering workshop	-	-	3	1.5	15	35	50
9	MC	Environmental Science	2	-	-	-	-	-	-
Total			**17**	**0**	**9**	**19.5**	**195**	**455**	**650**

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Subject	MATHEMATICS–II (VECTOR & TRANSFORM CALCULUS)				
Year/semester	I B.Tech / II Sem	L	T	P	C
Regulation year	R - 20	3	0	0	3

Course Objectives:

1. Find the vector differentiation and Integration
2. Apply the techniques of Laplace transforms in engineering studies
3. Learn the Fourier series of periodic functions and expand a function in sine and cosine series
4. Solve problems related to engineering applications using integral transform techniques
5. Evaluate the problems to engineering applications using Z- transform techniques

Course Outcomes:

After completing this course, the students will be able to

1. Understand gradient, divergence, curl and their physical significance.
2. Compute line, surface and volume integrals and evaluate the work done, flux, potential functions.
3. Make use of Laplace transforms in solving the differential equations with the initial and boundary conditions.
4. Compute Fourier series of periodic functions.
5. Solve problems related to engineering applications using transform techniques

SYLLABUS

UNIT - I

Vector Differentiation: Vector Differentiation - Scalar and Vector Fields, Level surfaces, Directional Derivative, Gradient of a Scalar Field, Divergence, Curl of a vector field and applications, Vector Identities

UNIT - II

Vector Integration: Vector Integration - Line integral, work done, areas, Surface integrals. Vector integral theorems - Green's theorem, Stokes theorem and Gauss Divergence theorem (All theorems without proof) and applications areas,surface areas and volumes.

UNIT - III

Laplace Transforms: Laplace transform-Definition-conditions for existence– Linear Property - Shifting Theorems, Laplace transforms of Standard Functions-Transforms of derivatives and integrals–Unit step function–Dirac delta function.

Inverse Laplace transforms by Partial fractions–Convolution theorem (without proof) – inverse by convolution, Solving ordinary differential equations with constant coefficients.

UNIT – IV

Fourier Series: Introduction, Periodic function, Dirichlet's conditions, Fourier series of periodic function, Fourier series at the point of discontinuity, Fourier series of even and odd functions, Half-range Fourier Sine and Cosine series. Fourier series in an arbitrary interval.

UNIT - V

Fourier Transforms and Z-Transforms: Fourier integral theorem (only statement) – sine and cosine integrals, Fourier transforms – sine and cosine transforms –Inverse Formulae-Properties-Finite Fourier Transforms.

Z-transform – properties – Damping rule – Shifting rule – Initial and final value theorems – Inverse Z –transform - Convolution theorem – solving difference equations by using Z-transforms.

Text Books:

1. B. S. Grewal, Higher Engineering Mathematics, 42nd Ed., Khanna Publishers, New Delhi, 2012
2. Erwin.Kreyszig,Advanced Engineering Mathematics,9th Ed., Wiley, 2012

References:

1. T.K.V.Iyengar, B. Krishna Ghandhi, S. Ranganathan and M.V.S.S.N.Prasad, Engineering Mathematics, Volume-I, 12th Ed., S. Chand Publishers, 2014
2. B. V. Ramana, Engineering Mathematics, 4th Ed., Tata McGraw Hill, New Delhi, 2009
3. D. S. Chandrashekharaiah, Engineering Mathematics, Volume 1, Prism Publishers, 2010
4. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, reprint, 2008

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Subject	ENGINEERING CHEMISTRY				
Year/semester	I B.Tech / II Sem	L	T	P	C
Regulation year	R - 20	3	0	0	3

Course Objectives:

1. To gain the knowledge on Polymer based materials in household appliances, aerospace and automotive industries.
2. To learn the basic principles and applications of Electrochemistry.
3. To understand the mechanism of corrosion and how it can be prevented.
4. Explain the importance and usage of water as basic material in almost all the industries; interpret drawbacks of steam boilers and also how potable water is supplied for drinking purposes.
5. Relate the need of fuels as a source of energy to industries like thermal power stations, steel, fertilizer industry etc., and hence introduced.
6. To train the students on the principles and applications of Cement, Refractories and Lubricants.

Course Outcomes:

After completing the course, Students will be able to,

1. Recall the information related to polymers and their application. (Remembering)
2. Distinguish between different parts in electrochemical cell, batteries and fuel cells. (Analyzing)
3. Solve the corrosion related problems. (Applying)
4. Use the information related to water treatment methods. (Applying)
5. Classify the different types of fuels and its applications.(Understanding)
6. Design manufacturing process of cement. (Creating)

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SYLLABUS

UNIT – I

Polymer Chemistry: Introduction to polymers, functionality of monomers, co-polymerization, Stereospecific polymerization with specific examples. **Plastics -** Thermoplastics and Thermo settings, Preparation, Properties and Applications of – Bakelite, Urea-Formaldehyde, Nylon-6,6, Carbon fibres. **Elastomers**–Buna-S, Buna-N– Preparation, Properties and Applications. **Conducting polymers** – polyacetylene, polyaniline, polypyrroles – Mechanism of conduction and Applications.

UNIT - II

Fuel Technology: Fuel - Introduction – Calorific value - HCV and LCV – Bomb calorimeter – Numerical problems – Coal — Proximate and Ultimate analysis –Significance of the analysis.
Liquid fuels – Petroleum- Refining – Cracking – Petrol knocking – Diesel knocking - Octane and Cetane ratings – Anti-knock agents. **Gaseous fuels** – Natural gas, LPG and CNG.
Bio-fuels- Bio-diesel and Power alcohol.

UNIT – III

Electrochemistry and Corrosion

PART-1: Electrochemistry and Its Applications

Electrodes –Reference electrodes (Hydrogen electrode and Calomel electrode), Electrochemical cell, Nernst equation. Concept of pH, pH meter and applications of pH metry, Potentiometry-Potentiometric titrations (Redox titrations), Concept of Conductivity, Conductivity cell, Conductometric titrations (acid-base titrations). Primary cells – Dry cell - Zinc-air battery, Secondary cells – Lead acid battery, Lithium-ion batteries- working of the batteries including cell reactions, and button cells.
Fuel cells - Hydrogen-Oxygen and Methanol-Oxygen fuel cells – working of the cells.

PART-2: Chemistry of Corrosion

Corrosion: Introduction to corrosion, Chemical and Electrochemical theory of corrosion, Pilling-Bedworth ratio rule, Differential aeration corrosion, Waterline corrosion and Galvanic corrosion.
Environmental factors (pH, temperature, Dissolved Oxygen) affecting the rate of corrosion.
Protection – Galvanizing, Tinning, Electroplating and Electro less plating (Nickel and Copper).
Organic coatings - Paints (constituents and functions).

UNIT – IV

Water Technology: Introduction –Soft Water and Hardness of water, Estimation of hardness by EDTA Method - Boiler troubles - scale and sludge, Industrial water treatment – Specifications for drinking water, Bureau of Indian Standards(BIS) and World health organization(WHO) standards, Zeolite and Ion-exchange processes. Municipal water treatment –Break point of chlorination. Deflouridation technique.

Desalination of Brackish water- Reverse Osmosis (RO) and Electrodialysis.

UNIT – V

CHEMISTRY OF MATERIALS: Cement: Introduction to Building materials – Portland cement, constituents, manufacturing process- raw materials for manufacturing process, reactions below 1300^{o}C and reactions between 1300 and 1450^{o}C, reactions during cooling, grinding or storage, chemical equations, Chemistry of setting and hardening of cement (hydration, hydrolysis, equations).

Lubricants: Definition, Properties and Applications.

Refractories: - Definition, Classification, Properties and Applications.

Standard Books:

1. Engineering Chemistry by Jain and Jain; Dhanpat Rai Publication Co.
2. Engineering Chemistry by Shikha Agarwal; Cambridge University Press, 2015 edition.

Reference Books:

1. Engineering Chemistry by Prasanth Rath, Cengage Learning, 2015 edition.
2. A text book of Engineering Chemistry by S. S. Dara; S. Chand & Co Ltd., Latest Edition.
3. A text book of Engineering Chemistry bySashi Chawla, Dhanpat Rai & Co. 2017

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Subject	BUILDING MATERIALS &CONCRETE TECHNOLOGY				
Year/semester	I B.Tech / II Sem	L	T	P	C
Regulation year	R - 20	3	0	0	3

Course Objectives:

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

Course Outcomes:

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

SYLLABUS

UNIT - I

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

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

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

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

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

UNIT – II

Aggregates: Classification of aggregate, Bond, Strength and other mechanical properties ofaggregate, Physical properties of aggregate, bulking of sand, Deleterious substance in aggregate, Soundness of aggregate, Alkali-Aggregate reaction – Thermal properties, Sieve

analysis – Fineness modulus – Grading curves – Grading of fine and coarse aggregates as per relevant IS code, Maximum aggregate size

Portland Cement: Chemical composition, Hydration, Structure of hydrated cement–Setting of cement, Fineness of cement, Tests for physical properties – Different grades of cements **Supplementary cementitious materials:** Fly ash, GGBS, Silica fume, Rice husk ash, Calcinated ash(Basic properties and their contribution to concrete strength) **Admixtures:** Mineral and Chemical admixtures

UNIT - III

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

UNIT - IV

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

UNIT - V

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

Text Books:

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

Reference Books:

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

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Subject	ENGINEERING MECHANICS				
Year/semester	I B.Tech / II Sem	L	T	P	C
Regulation year	R - 20	3	0	0	3

Course Objectives:

1. Understand particle, body, rigid body, concept of force, analysis of forces acting on a rigid body.
2. Understand moment and the principle of moments.
3. Understand the laws of friction and its applications.
4. Analyzing trusses for its member forces.
5. Understand the concept of centre of gravity and area moment of inertia**.**
6. Understanding principles of kinematics and kinetics applied to rigid bodies.

Course Outcomes:

The students will be able to:

1. Simplify the system of forces and moments to equivalent systems and construct free body diagrams and develop appropriate equilibrium equations.
2. Analyze systems with friction and for member forces.
3. Determine centroids of simple and composite areas and moment of inertia.
4. Apply the fundamental concepts of kinematics of particles and rigid bodies along with equilibrium condition in solving engineering problems.
5. Analyze the problems of simple systems and connected bodies for displacement, velocity and acceleration.

SYLLABUS

UNIT - I

STATICS OF PARTICLES AND RIGID BODIES

Introduction: Fundamental concepts and principles of engineering mechanics – Forces on particles – Concurrent forces in a plane – Resolution of forces – Resultant of several concurrent forces.

Equilibrium of Particles: Free body diagram – Equilibrium of rigid bodies in two dimensions- Equilibrium of a two, three force body.

Moment of a force – Varignon's theorem – Equivalent system of forces – Reduction of system of forces into single force and couple.

UNIT - II

FRICTION AND TRUSSES

Friction: Introduction-Types of friction – laws of Friction – Limiting friction – Cone of friction- static and Dynamic Frictions. Applications of Friction: Wedges – Ladder friction.

Analysis of trusses – statically determinate and indeterminate structures – Method of Joints.

UNIT - III

PROPERTIES OF SURFACES AND VOLUMES

Centre of Gravity: Centroids of lines, areas, and volumes – Determination of centroids by integration – Theorem of Pappu's.

Area Moment of Inertia: Second moment or Moment of inertia of an area – Determination of moment of inertia of area by integration – Radius of gyration – Parallel and perpendicular axis theorems

UNIT - IV

KINEMATICS

Rectilinear motion: **U**niform velocity and uniformly accelerated motion – Rectangular components of velocity and acceleration, Variable acceleration

Curvilinear motion: Normal and tangential components – Radial and transverse components – Motion of Projectile

UNIT - V

KINETICS

Newton second law – D. Alembert's principle, Principle of work and energy for a rigid body – connected bodies – Principle of impulse and momentum – connected bodies.

Text Books:

1. Timoshenko and Young, Engineering Mechanics, 3rdEd, McGraw HillPublishers, 2006.
2. Engineering Mechanics - Statics and Dynamics/ Ferdin L. Singer/Harper International Edition.

Reference Books:

1. Engineering Mechanics: Statics and Dynamics/James L. Meriam, L. Glenn Kraige/7th/John Wiley & Sons/2012.
2. Engineering Mechanics: Statics and Dynamics/R. C. Hibbeler/13th/ Prentice Hall/2012.
3. Vector Mechanics for Engineers: Statics and Dynamics/ Ferdinand. P. Beer. E, Russell Johnston Jr., David Mazurek, Philip J Cornwell/6th/ McGraw-Hill/2012.
4. Theory and problems of Engineering Mechanics -Statics and Dynamics/ Mclean, and Nelson/ Schaum Series/2010.
5. Engineering Mechanics -Statics and Dynamics A K Tayal /Umesh Publications/2008.
6. Engineering Mechanics/ Rajasekaran.S, &Sankarasubramanian.G/3rd/Vikas Publishing House/2004.
7. A Text book of Engineering Mechanics/ Dr.Bansal.R.K, & Sanjay Bansal /8th/Lakshmi publications/2014.
8. A Text book of Engineering Mechanics/ R. S. Kurmi /20th/S. Chand
9. A Text book of Engineering Mechanics/ S. S. Bhavakatti /2nd/New age international/2014.

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Subject	COMPUTER PROGRAMMING				
Year/semester	I B.Tech / II Sem	L	T	P	C
Regulation year	R - 20	3	0	0	3

Course Objectives:

1. Formulating algorithmic solutions to problems and implementing algorithms in C.
2. Understanding branching, iteration and data representation using arrays.
3. Modular programming and recursive solution formulation.
4. Understanding arrays, pointers and dynamic memory allocation.
5. Understanding Strings and Structures

Course Outcomes:

1. Write, compile and debug programs in C language.
2. Use different data types in a computer program.
3. Design programs involving decision structures, loops and functions.
4. Explain the difference between call by value and call by reference.
5. Understand the dynamics of memory by the use of pointers.
6. Understand the sorting and searching algorithms.

SYLLABUS

UNIT - I

Introduction to C Programming- Identifiers, The main () Function, The printf () Function **Programming Style -** Indentation, Comments, Data Types, Arithmetic Operations, Expression Types, Variables and Declarations, Negation, Operator Precedence and Associativity, Declaration Statements, Initialization.

Assignment - Implicit Type Conversions, Explicit Type Conversions (Casts), Assignment Variations, Mathematical Library Functions, Interactive Input, Formatted Output, Format Modifiers.

UNIT - II

Control Flow-Relational Expressions - Logical Operators:

Selection: if-else Statement, nested if, examples, Multi-way selection: switch, else-if, examples. **Repetition:** Basic Loop Structures, Pretest and Posttest Loops, Counter-Controlled and Condition-Controlled Loops, The while Statement, The for Statement, Nested Loops, The do-while Statement.

UNIT - III

Arrays & Pointers:

Arrays: One-Dimensional Arrays, Input and Output of Array Values, Array Initialization, Two-Dimensional Arrays, Larger Dimensional Arrays- Matrices

Pointers: Concept of a Pointer, Initialisation of pointer variables, passing by address, Dangling memory, address arithmetic, Dynamic memory management functions, command line arguments.

UNIT - IV

Modular Programming: Function and Parameter Declarations, Returning a Value, Classifications of Functions, Variable Scope, Variable Storage Class, Local Variable Storage Classes, Global Variable Storage Classes, Pass by Reference, Passing Addresses to a Function, Array as a Function arguments. Case Study: Recursion - Mathematical Recursion, Recursion versus Iteration

UNIT - V

Strings & Structures: Strings: String Fundamentals, String Input and Output, String Processing, Library Functions. Structures: Derived types, Structures declaration, Initialization of structures, accessing structures, nested structures, arrays of structures, structures and functions, pointers to structures, self referential structures, unions, typedef, bit-fields.

Text books:

1. ANSI C Programming, Gary J. Bronson, Cengage Learning.
2. Let us C Authentic Guide to C Programming Language by yashavant kanetkar.
3. The C programming Language, Dennis Richie and Brian Kernighan, Pearson Education.

Reference books:

1. C Programming-A Problem Solving Approach, Forouzan, Gilberg, Cengage.

2. Programming with C, Bichkar, Universities Press.
3. Programming in C, ReemaThareja, OXFORD.
4. C by Example, Noel Kalicharan, Cambridge.

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Subject	BUILDING PLANNING & COMPUTER AIDED BUILDING DRAWING				
Year/semester	I B.Tech / II Sem	L	T	P	C
Regulation year	R - 20	0	0	3	1.5

Course Objectives:

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

Course Outcomes:

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

Major Equipment/Instruments/System required

1. Computer with specification suitable for relevant CAD software with any suitable CAD Software
2. Laser Printer preferably for the output of A3 size.

Week 1, 2 and 3

Concepts to be studied

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

Building Byelaws: Introduction – Terminology – Objectives of building byelaws – Principles under laying building byelaws – 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, 5and 6

Concepts to be studied

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

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

Exercise 2

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

Exercise 3

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

Week 7, 8, 9 and 10

Concepts to be studied

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

Exercise 4

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

Exercise 5

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

Week 11, 12, 13 and14

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, 2BHK 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.

Suggested student activities:

6. Prepare report on Provisions given in National Building Code 2005.
7. Collect and study building Bye laws, rules and regulation for planning as per local competent authority.
8. Prepare list of the documents required for obtaining permission for construction of residential building/apartment from competent authority and write report.
9. Prepare list of the documents required for obtaining permission for construction of commercial building from competent authority and write report.

10. Prepare a model of a simple building using card board showing different components with suitable color.

Subject	ENGINEERING CHEMISTRY LAB				
Year/semester	I B.Tech / II Sem	L	T	P	C
Regulation year	R - 20	0	0	3	1.5

Course 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.

Experiments:

1. Trial experiment - 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 $KMnO_4$ using standard Oxalic acid solution.
4. Estimation of MnO2 in Pyrolusite.
5. Determination of Copper using standard $K_2Cr_2O_7$ solution.
6. Determination of temporary and permanent hardness of water using standard EDTA solution.
7. Determination of Vitamin – C.
8. Determination of P^H of the given sample solution using P^H meter.
9. Conductometric titration between strong acid and strong base.
10. Potentiometric titration between strong acid and strong base.
11. Estimation of copper by Colorimetry.
12. Photo Chemical Reduction of Ferric Salt (Blue-Printing).
13. Adsorption of acetic acid on charcoal.
14. Determination of rate of corrosion.
15. Preparation of a polymer.
16. Thin layer chromatography.

Reference Books:

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

2. Dr. Jyotsna Cherukuri (2012) Laboratory Manual of Engineering chemistry-II, VGS, Techno Series.
3. Chemistry Practical Manual, Lorven Publications.
4. Practical Engineering Chemistry, K. Mukkanti (2009) B.S. Publication

Subject	ENGINEERING WORKSHOP				
Year/semester	I B.Tech / II Sem	L	T	P	C
Regulation year	R - 20	0	0	3	1.5

Course Objectives:

1. To develop a skill in dignity of labour, precision, safety at work place, team working and development of right attitude.
2. To identify the hand tools and instruments used in the fitting, carpentry, black smithy and tin smithy trades.
3. To acquire skills in basic engineering practices like fitting, carpentry, black smithy and tin smithy etc.
4. To gain measuring and marking skills.
5. To gain basic knowledge in electrical wiring and assembly and disassembly of computer.

Course Outcomes:

The student will be able to:

1. Identify the basic tools and equipments used in carpentry, fitting, black smithy, house wiring and tin smithy.
2. Produce different joints in carpentry trade such as lap and dove tail joint
3. Produce various fittings in the trade of fitting such as sqaure fit and V fit.
4. Make various objects in tinsmithy trade such as open scoop and square box.
5. Perform various basic house-wiring connections
6. Produce various shapes in black smithy trade such as round rod to square rod and S hook
7. Assemble & Disassemble of computer

Note: At least two exercises to be done from first five trades & experiment from last trade is compulsory.

TRADES:

Carpentry:

1. T-Lap Joint
2. Cross Lap Joint
3. Dovetail Joint
4. Mortise and Tenon Joint

Fitting:

1. Vee Fit
2. Square Fit
3. Half Round Fit
4. Dovetail Fit

Black Smithy:

1. Round rod to Square
2. S-Hook
3. Round Rod to Flat Ring
4. Round Rod to Square headed bolt

House Wiring:

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

Tin Smithy:

1. Taper Tray
2. Square Box without lid
3. Open Scoop
4. Funnel

System Assembly:

1. Assembly & Disassembly of computer

Text books:

1. Workshop Technology Vol I & II/ S K Hajra Choudhury, A K Hajra Choudhury, N. Roy/ Media Promoters & Publishers Pvt. Ltd.
2. Workshop Practice/H S Bawa/ McGraw Hill Education; 2nd edition.

Reference books:

1. Work shop Manual / P.Kannaiah/ K.L.Narayana/ SciTech Publishers.
2. Engineering Practices Lab Manual/Jeyapoovan, Saravana Pandian, 4/e Vikas
3. Dictionary of Mechanical Engineering/GHF Nayler/Jaico Publishing House

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Subject	ENVIRONMENTAL SCIENCE				
Year/semester	I B.Tech / II Sem	L	T	P	C
Regulation year	R - 20	2	0	0	0

Course Objectives:

To make the student to get awareness on environment, to understand the important of protecting natural recourses, ecosystems for futures generations and pollution causes due to the day to day activates of human life to save Earth from the inventions by the engineers.

Course Outcomes:

Students will be able to:

1. Articulate the basic structure, functions, and processes of key social systems affecting the Environment.
2. Explain how Natural Recourses should be used.
3. Identify the threats to biodiversity.
4. Understand causes, effects and control measures of Environmental pollution.
5. Gain knowledge about Watershed management and Environmental ethics. Gain a rigorous foundation in various scientific disciplines as they apply to environmental science, such as ecology, evolutionary biology, hydrology, and human behavior.

SYLLABUS

UNIT – I

Multidisciplinary nature of Environmental Science and Ecosystems

Definition, Scope and Importance – Sustainability: Need for public awareness-Human population and Environment. Ecosystems: Concept of an ecosystem. - Structure and function of an ecosystem. -Types of EcosystemForest, Grassland, Desert and Aquatic Ecosystems– Food chains, food webs and ecological pyramids.

UNIT – II

Natural Resources

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

Water resources: Conflicts over water, Dams – benefits and problems

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

Energy resources: Growing energy needs, renewable and non-renewable energy sources Food resources: World food problems.

Land resources: Wasteland reclamation. Role of an individual in conservation of natural resources.

UNIT – III

Biodiversity and its conservation

Definition, Genetic, species and ecosystem diversity- classification - Value of biodiversity: Consumptive use, Productive use, Social use, Biodiversity at national and local levels. Hot-spots of biodiversity - Threats to biodiversity - Endangered and Endemic species of India – 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. Solid Waste Management: Sources, effects and control measures of urban and industrial solid wastes. Bio medical and e-waste management. Global Environmental Challenges: Global warming and climate change-Acid rains, Ozone layer depletion.

UNIT – V

Social Issues and Environmental Management

Urban problems related to energy -Water conservation, Rain water harvesting-Resettlement and rehabilitation of people. Environmental Protection Act –Air Act –Water Act - Wildlife Protection Act -Forest Conservation Act-Public awareness. International protocols: Stockholm and Rio Summit, Kyoto protocol and Montreal Protocol. Impact Assessment and its significance various stages of EIA, Environmental audit, Ecotourism. The student should Visit an Industry / Ecosystem.

Text Books:

1. A Textbook of Environmental Studies, Shashi Chawla, TMH, New Delhi.
2. Textbook of Environmental Studies for Undergraduate Courses by ErachBharucha for University Grants Commission.
3. Environmental Studies, R. Rajagopalan, 2nd Edition, 2011, Oxford University Press

References:

1. Environmental Studies, K. V. S. G. Murali Krishna, VGS Publishers, Vijayawada.
2. Text Book of Environmental Studies, DeekshitaDave& P. Udaya Bhaskar, Cengage Learning.
3. Textbook of Environmental Science and Technology – Dr. Anji Reddy, BS Publications.
4. Environment Studies, Anubha Kaushik, C P Kaushik, New Age International Publishers, 2014.
5. Environmental Studies, P. N. Palanisamy, P. Manikandan, A. Geetha, and K. Manjula Rani; Pearson Education, Chennai.
6. Environmental Studies, Benny Joseph, Tata McGraw Hill Co, NewDelhi.

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Course Structure – R20
(With effect from 2020-2021)

II Year - I Semester

S.No	Category	Course Title	L	T	P	C	IM	EM	TM
1	BSC	Mathematics -III (Complex Variables and PDE)	3	-	-	3	30	70	100
2	PCC	Strength of Materials - I	3	-	-	3	30	70	100
3	PCC	Fluid Mechanics	3	-	-	3	30	70	100
4	PCC	Surveying	3	-	-	3	30	70	100
5	PCC	Highway Engineering	3	-	-	3	30	70	100
6	PCC LAB	Concrete Technology Lab	-	-	3	1.5	15	35	50
7	PCC LAB	Highway Engineering Lab	-	-	3	1.5	15	35	50
8	PCC LAB	Surveying Field Work (Lab)	-	-	3	1.5	15	35	50
9	SOC	Building & Earth Science	1	-	2	2	15	35	50
10	MC	Constitution of India	2	-	-	-	-	-	-
Total			**18**	**0**	**11**	**21.5**	**210**	**490**	**700**

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Subject	Mathematics III (Complex Variables & PDE)				
Year/semester	II B.Tech/I Sem	L	T	P	C
Regulation year	R - 20	3	0	0	3

Course Objectives:

To enable the students to

1. Make use the significance of differentiability and analyticity for complex variable functions and be familiar with the Cauchy-Riemann equations.
2. Find integrals along a path in the complex plane using the Cauchy's theorem and Residue theorem.
3. Solve the singularities of complex variable function by expanding them into Taylor's and Laurent's series and finding residues.
4. Make the students learn modeling various physical phenomena as first and higher order PDE and applications

Course Outcomes:

After undergoing this course, students will be able to

1. Understand the differentiability and analyticity for complex variable functions and learn sufficient conditions for analyticity
2. Evaluate the integration of complex valued functions.
3. Expand the functions in power series, classify the singularities of complex function
4. Model first order linear and non-linear partial differential equations and solve analytically
5. Model higher order partial differential equations and solve analytically and physical problems of engineering like steady and unsteady heat conduction, vibration of string, etc.

SYLLABUS

UNIT - I

Functions of Complex Variables: Continuity and differentiability, Analyticity, properties, Cauchy Riemann equations in Cartesian and polar coordinates, harmonic and conjugate harmonic functions, Milne – Thompson method.

UNIT – II

Complex Integration: Integration of complex functions – Line Integrals, Cauchy's Integral theorem, Cauchy's Integral Formula - Generalized Cauchy's Integral formula (without proofs)

UNIT – III

Complex power series and Residues: Complex power series-Taylor's Series and Laurent's Series, Singularities, Poles and Residues-Cauchy Residues theorem (without proof), evaluation of integrals of type $\int_{-\infty}^{\infty} f(x)dx$ and $\int_0^{2\pi} f(cos\theta, sin\theta)d\theta$ using Residue theorem.

UNIT – IV

First Order Partial Differential Equations: Formation of Partial differential equations by elimination of arbitrary constants and arbitrary functions– solutions of first order linear (Lagrange) equations and nonlinear equations-standard types

UNIT – V

Higher Order Partial Differential Equations and Applications: Solutions of Linear Partial differential equations with constant coefficients. RHS terms of the type e^{ax+by}, Sin(ax+by), Cos (ax+by), $x^m y^n$. Classification of second order partial differential equations-parabolic, elliptical and hyperbolic.

Method of Separation of Variables, Applications to wave equation, heat conduction equation in one dimensions and Laplace equation in two dimensions

Text Books:

1. B. S. Grewal, Higher Engineering Mathematics, 42nd Ed., Khanna Publishers, New Delhi, 2012
2. Erwin Kreyszig, Advanced Engineering Mathematics, 9th Ed., Wiley, 2012.

References:

1. T.K.V.Iyengar, B. Krishna Ghandhi, S. Ranganatham and M.V.S.S.N.Prasad, Engineering Mathematics, Volume-I, 12th Ed., S. Chand Publishers, 2014
2. D. S. Chandrashekharaiah, Engineering Mathematics, Volume 1, Prism Publishers, 2010
3. B. V. Ramana, Engineering Mathematics, 4th Ed., Tata McGraw Hill, New Delhi, 2009
4. S.KaleshaValli, G.VenkataRao and A.V.Papa Rao, Engineering Mathematics-I, Cengage Publications, 2018.

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Subject	STRENGTH OF MATERIALS - I				
Year/semester	II B.Tech/I Sem	L	T	P	C
Regulation year	R - 20	3	0	0	3

Course Learning Objectives:

The objective of this course is:

1. To impart preliminary concepts of Strength of Material and Principles of Elasticity and Plasticity Stress conditions and to develop diagrams of variation of various stresses across the length.
2. To give concepts of stresses developed in the cross section and bending equations calculation of section modulus of sections with different cross sections
3. The concepts above will be utilized in measuring deflections in beams under various loading and support conditions
4. To classify cylinders based on their thickness and to derive equations for measurement of stresses across the cross section when subjected to external pressure.

Course Outcomes:

1. The student will be able to understand the basic materials behavior under the influence of different external loading conditions and the support conditions
2. The student will be able to draw the diagrams indicating the variation of the key performance features like bending moment and shear forces
3. 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
4. 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 cylindrical shells: Derivation of formula for longitudinal and circumferential stresses - hoop, longitudinal and volumetric strains – changes in diameter, and volume of thin cylinders.

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

Text books:

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

References:

1. Mechanics of Materials- by R. C.Hibbler, Pearson publishers
2. Mechanics of Solids – E P Popov, Prentice Hall.

3. Strength of Materials by B.S.Basavarajaiah and P. Mahadevappa, 3rd Edition,Universities Press
4. Mechanics of Structures Vol – I by H.J.Shah and S.B.Junnarkar, Charotar Publishing House Pvt. Ltd.

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Subject	FLUID MECHANICS				
Year/semester	II B.Tech/I Sem	L	T	P	C
Regulation year	R - 20	3	0	0	3

Course Learning Objectives:

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

Course Outcomes:

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

1. Understand the various properties of fluids and their influence on fluid motion and analyse a variety of problems in fluid statics and dynamics.
2. Calculate the forces that act on submerged planes and curves.
3. Ability to analyse various types of fluid flows.
4. Apply the integral forms of the three fundamental laws of fluid mechanics to turbulent and laminar flow through pipes and ducts in order to predict relevant pressures, velocities and forces.
5. Able Measure the quantities of fluid flowing in pipes, tanks and channels.

SYLLABUS

UNIT - I

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

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

UNIT – II

Fluid Kinematics: Description of fluid flow, Stream line, path line and streak line and stream tube. Classification of flows: Steady, unsteady, uniform, non-uniform, laminar, turbulent,

rotational and irrotational flows – Equation of continuity for one, two, three dimensional flows – stream and velocity potential functions, flow net analysis.

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

UNIT – III

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

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

UNIT – IV

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

UNIT – V

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

Text Books:

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

References:

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

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Subject	SURVEYING				
Year/semester	II B.Tech/I Sem	L	T	P	C
Regulation year	R - 20	3	0	0	3

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

1. To demonstrate the basic surveying skills
2. To use various surveying instruments.
3. To perform different methods of surveying
4. To compute various data required for various methods of surveying.

Course Outcomes:
Course will enable the student to:

1. Apply the knowledge to calculate angles, distances and level
2. Identify data collection methods and prepare field notes
3. Understand the working principles of survey instruments, measurement errors and corrective measures
4. 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.

Measurement of Distances and Directions

Linear Distances- Approximate methods, Direct Methods-Accessories in chain surveying- Chains- Tapes, ranging, Tape corrections.

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

UNIT - II

Plane Table: Accessories and methods of plane table surveying.

Levelling: Concept and Terminology, Levelling Instruments and their Temporary and permanent adjustments- method of levelling.

Contouring: Characteristics and Uses of contours- methods of conducting contour surveys. And their plotting.

UNIT - III

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

Tacheometric Surveying: Stadia and tangential methods of Tacheometry. Distance and Elevation formulae for Staff vertical position.

UNIT - IV

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

Computation Of Areas and Volumes: Area from field notes, computation of areas along irregular boundaries and area consisting of regular boundaries. Embankments and cutting for a level section and two-level sections with and without transverse slopes, determination of the capacity of reservoir, volume of barrow pits.

UNIT - V

Modern Field Survey Systems: Principle of Electronic Distance Measurement, Modulation, Types of EDM instruments, Total Station – Parts of a Total Station – Accessories, Advantages and Applications, Errors in Total Station Survey, Introduction to Global Positioning Systems- Principle - Advantages and Disadvantages- Applications – Segments.

Text Books:

1. Arora, K.R., Surveying, Vol-I, II and III, Standard Book House, 2015.
2. Madhu, N, Sathikumar, R and Satheesh Gobi, Advanced Surveying: Total Station, GIS and Remote Sensing, Pearson India, 2006.
3. B.C.Punmia, Surveying, Vol-I, II and III, Laxmi Publications.
4. Advance Surveying, Satish Gopi, R. Sathi Kumar and N. Madhu, Pearson Publications.
5. Text book of Surveying, C. Venkataramaiah, University press, India Limited.
6. Surveying and levelling, R. Subramanian, Oxford University press.

References:

1. Bhavikatti, S.S., Surveying and Levelling, Vol. I and II, I.K. International, 2010
2. Anji Reddy, M., Remote sensing and Geographical information system, B.S. Publications, 2001.
3. Manoj, K. Arora and Badjatia, Geomatics Engineering, Nem Chand & Bros, 2011
4. Text book of Surveying, S.K. Duggal (Vol No. 1&2), Tata McGraw Hill Publishing Co. Ltd. New Delhi.
5. Text book of Surveying, Arora (Vol No. 1&2), Standard Book House, Delhi.

VISHNU INSTITUTE OF TECHNOLOGY: BHIMAVARAM
(AUTONOMOUS)
DEPARTMENT OF CIVIL ENGINEERING

Subject	HIGHWAY ENGINEERING				
Year/semester	II B.Tech/I Sem	L	T	P	C
Regulation year	R - 20	3	0	0	3

Course Objectives:

The objectives of this course are:

1. To impart different concepts in the field of Highway Engineering.
2. To acquire design principles of Highway Geometrics and Pavements
3. 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.

Text Books:

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

References:

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

VISHNU INSTITUTE OF TECHNOLOGY: BHIMAVARAM
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DEPARTMENT OF CIVIL ENGINEERING

Subject	CONCRETE TECHNOLOGY LAB				
Year/semester	II B.Tech/I Sem	L	T	P	C
Regulation year	R - 20	0	0	3	1.5

Course Objectives:

1. To study basic properties ingredients of concrete, fresh and hardened concrete properties

Course Outcomes:

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

1. Determine consistency and fineness and setting times of cement.
2. Determine specific gravity, soundness of cement and compressive strength of cement.
3. Determine workability of cement concrete by compaction factor, slump and Vee–Bee tests
4. Determine specific gravity of coarse aggregate and fine aggregate by Sieve analysis.
5. Determine flakiness and elongation index of aggregates.
6. Determine bulking of sand.
7. Understand non-destructive testing procedures on concrete.

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

1. Determination of normal Consistency and fineness of cement.
2. Determination of initial setting time and final setting time of cement.
3. Determination of specific gravity and soundness of cement.
4. Determination of compressive strength of cement.
5. Determination of grading and fineness modulus of Coarse aggregate by sieve analysis.
6. Determination of specific gravity of coarse aggregate
7. Determination of grading and fineness modulus of fine aggregate (sand) by sieve analysis
8. Determination of bulking of sand.
9. Design a Concrete Mix for any one grade of Concrete
10. Determination of workability of concrete by compaction factor method.
11. Determination of workability of concrete by slump test
12. Determination of workability of concrete by Vee-bee test.
13. Determination of compressive strength of cement concrete and its young's modulus
14. Non-Destructive testing on concrete (for demonstration)

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.

Reference:

1. Concrete Manual by M.L.Gambhir.

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DEPARTMENT OF CIVIL ENGINEERING

Subject	HIGHWAY ENGINEERING LAB				
Year/semester	II B.Tech/I Sem	L	T	P	C
Regulation year	R - 20	0	0	3	1.5

Course 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

1. Test aggregates and judge the suitability of materials for the road construction
2. Test the given bitumen samples and judge their suitability for the road construction
3. Obtain the optimum bitumen content for Bituminous Concrete

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.

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.

Text Books:

1. 'Highway Material Testing Manual' by S.K. Khanna, C.E.G Justo and A.Veeraraghavan, NemChand Brothers, New Chand Publications, New Delhi.
2. Highway Material Testing & Quality Control by Rao Wiley India pvt. Ltd., Noida, New Delhi.

Reference:

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

VISHNU INSTITUTE OF TECHNOLOGY: BHIMAVARAM
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DEPARTMENT OF CIVIL ENGINEERING

Subject	SURVEYING FIELD WORK (Lab)				
Year/semester	II B.Tech/I Sem	L	T	P	C
Regulation year	R - 20	0	0	3	1.5

Course Objectives:

1. To learn usage of different surveying instruments and methods of surveying.

Course Outcomes:

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

1. Apply the principles of surveying in field.
2. Identify data collection methods and prepare field notes
3. Handle basic survey instruments
4. Determine the area of a plot by using different methods

List of Field Works:

1. Measurement of distance by ranging and chaining.
2. Locating various objects by chain & cross staff surveying.
3. Determination of area of polygon by chain and cross staff survey.
4. Measurement of bearings of sides of traverse with prismatic compass and computation of correct included angle.
5. Correction for Local Attraction by Prismatic Compass.
6. Plane table survey; finding the area of a given boundary by the method of radiation.
7. Plane table survey; finding the area of a given boundary by the method of intersection.
8. Finding the area of the given boundary using compass (Closed Traverse).
9. Determination of elevation of various points with dumpy level by collimation plane method and rise & fall method.
10. Fly levelling: Height of the instrument method (differential levelling).
11. Fly levelling (differential levelling).
12. Two exercises on contouring.

Note: Any 10 field work assignments must be completed.

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DEPARTMENT OF CIVIL ENGINEERING

Subject	BUILDING AND EARTH SCIENCE				
Year/semester	II B.Tech/I Sem	L	T	P	C
Regulation year	R - 20	1	0	2	2

Course Objectives:

1. To study basic techniques of brick masonry, testing of bricks.
2. To study about minerals, rocks, topographical maps and geo-physical exploration.

Course Outcomes:

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

1. Apply various techniques of brick masonry.
2. Identify different tests required to assess the quality of bricks.
3. Understand physical properties of various minerals and rocks
4. Interpret topographical maps and various conventional signs in it.
5. Understand geophysical exploration techniques.

List of Experiments:

1. Brick Masonry: Masonry 3' height with the following bonds and different thickness.
    a. Stretcher bond
    b. Header bond
    c. English bond and
    d. Flemish bond
2. Tests on Bricks:
    a. Shape and size of supplied brick.
    b. Water absorption of brick.
    c. Compressive strength of bricks.
3. Study and observations of physical properties of minerals.
4. Study and observations of physical properties of rocks.
5. Interpretation of Topographical maps.
6. Drawing of conventional signs of Topographical maps.
7. Electrical Resistivity method (Demo).
8. Seismic refraction method (Demo).

VISHNU INSTITUTE OF TECHNOLOGY: BHIMAVARAM
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DEPARTMENT OF CIVIL ENGINEERING

Subject	CONSTITUTION OF INDIA				
Year/semester	II B.Tech/I Sem	L	T	P	C
Regulation year	R - 20	2	0	0	0

The Constitution of India is the supreme law of India. Parliament of India cannot make any law which violates the Fundamental Rights enumerated under the Part III of the Constitution. The Parliament of India has been empowered to amend the Constitution under Article 368, however, it cannot use this power to change the "basic structure" of the constitution, which has been ruled and explained by the Supreme Court of India in its historical judgments. The Constitution of India reflects the idea of "Constitutionalism" – a modern and progressive concept historically developed by the thinkers of "liberalism" – an ideology which has been recognized as one of the most popular political ideology and result of historical struggles against arbitrary use of sovereign power by state. The historic revolutions in France, England, America and particularly European Renaissance and Reformation movement have resulted into progressive legal reforms in the form of "constitutionalism" in many countries. The Constitution of India was made by borrowing models and principles from many countries including United Kingdom and America.

The Constitution of India is not only a legal document but it also reflects social, political and economic perspectives of the Indian Society. It reflects India's legacy of "diversity". It has been said that Indian constitution reflects ideals of its freedom movement; however, few critics have argued that it does not truly incorporate our own ancient legal heritage and cultural values. No law can be "static" and therefore the Constitution of India has also been amended more than one hundred times. These amendments reflect political, social and economic developments since the year 1950. The Indian judiciary and particularly the Supreme Court of India has played an historic role as the guardian of people. It has been protecting not only basic ideals of the Constitution but also strengthened the same through progressive interpretations of the text of the Constitution. The judicial activism of the Supreme Court of India and its historic contributions has been recognized throughout the world and it gradually made it "as one of the strongest court in the world".

Course content:

1. Meaning of the constitution law and constitutionalism
2. Historical perspective of the Constitution of India
3. Salient features and characteristics of the Constitution of India
4. Scheme of the fundamental rights
5. The scheme of the Fundamental Duties and its legal status
6. The Directive Principles of State Policy – Its importance and implementation

7. Federal structure and distribution of legislative and financial powers between the Union and the States
8. Parliamentary Form of Government in India – The constitution powers and status of the President of India
9. Amendment of the Constitutional Powers and Procedure
10. The historical perspectives of the constitutional amendments in India
11. Emergency Provisions: National Emergency, President Rule, Financial Emergency
12. Local Self Government – Constitutional Scheme in India
13. Scheme of the Fundamental Right to Equality
14. Scheme of the Fundamental Right to certain Freedom under Article 19
15. Scope of the Right to Life and Personal Liberty under Article 21

VISHNU INSTITUTE OF TECHNOLOGY: BHIMAVARAM
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DEPARTMENT OF CIVIL ENGINEERING

Course Structure – R20
(With effect from 2020-2021)

II Year - II Semester

S.No	Category	Course Title	L	T	P	C	IM	EM	TM
1	BSC	M- IV (Numerical methods and Probability & Statistics)	3	-	-	3	30	70	100
2	PCC	Strength of Materials -II	3	-	-	3	30	70	100
3	PCC	Hydraulics and Hydraulic Machinery	3	-	-	3	30	70	100
4	ESC/PCC	Environmental Engineering	3	-	-	3	30	70	100
5	HSMC	Understanding Harmony	3	-	-	3	30	70	100
6	ESC/ PCC LAB	Environmental Engineering Laboratory	-	-	3	1.5	15	35	50
7	PCC LAB	Strength of Materials Laboratory	-	-	3	1.5	15	35	50
8	PCC LAB	Fluid Mechanics & Hydraulics Machinery Laboratory	-	-	3	1.5	15	35	50
9	SOC	Advanced Construction Planning Laboratory	-	-	4	2	15	35	50
10	MC	Critical Reading and Creative Writing	2	-	-	-	-	-	-
Total			**17**	**0**	**13**	**21.5**	**210**	**490**	**700**
Internship 2 Months (Mandatory) during summer vacation									
Honors/Minor courses			**3**	**1**	**0**	**4**			

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DEPARTMENT OF CIVIL ENGINEERING

Subject	Mathematics-IV(Numerical Methods, Probability &Statistics)				
Year/semester	II B.Tech/II Sem	L	T	P	C
Regulation year	R - 20	3	0	0	3

Course Objectives:

To enable the students to

1. Know the standard numerical methods to find roots of functions in practical engineering problems and identify the concepts of interpolation, to estimate the unknown functional values.
2. Identify the methods for finding the values of derivatives and finite integrals using numerical techniques.
3. Understand various statistical distributions
4. Decide the null or alternative hypotheses using the suitable test statistic

Course Outcomes:

After undergoing this course, students will be able to

1. Apply standard numerical methods to solve fundamental and practical engineering problems and understand the concepts of interpolation to estimate the unknown functional values.
2. Evaluate finite integrals and solving differential equations using numerical techniques
3. Understand the discrete and continuous probability distributions and apply relevant engineering problems
4. Perform inferential statistics to test hypothesis for large sample
5. Apply the concept of testing hypothesis for small samples to draw the inferences and estimate the goodness of fit.

SYLLABUS

UNIT - I

Solution of Algebraic and Transcendental Equations & Interpolation: Introduction- algebraic function and transcendental function - Bisection method, Regula –Falsi Method, Iteration Method, Newton- Raphson method.

Introduction, Finite Differences, Forward, Backward and Central Differences - Newton's forward and backward formulae –Gauss's forward and backward interpolation formulae - Lagrange's Interpolation Formula.

UNIT - II

Numerical Integration and Solution of Ordinary Differential Equations: Numerical Integration-Trapezoidal rule – Simpson's $1/3^{rd}$ Rule –Simpson's $3/8^{th}$ Rule.

Solution by Taylor's method, Euler's & Modified Euler's method, Runge- Kutta Method (4^{th} order)

UNIT - III

Probability Distributions: Basic concepts on probability, random variables (discrete and continuous)**,** probability distribution- Binomial, Poisson and Normal distributions and their properties

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. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, reprint, 2008.
2. B. V. Ramana, Engineering Mathematics, 4^{th} Ed., Tata McGraw Hill, New Delhi, 2009
3. S.C. Gupta, V.K. Kapoor Fundamentals of Mathematical Statistics a Modern Approach, 10th Edition 2000

References:

1. T.K.V.Iyengar, B. Krishna Ghandhi, S. Ranganathan and M.V.S.S.N.Prasad, Engineering Mathematics, Volume-I, 12^{th} Ed., S. Chand Publishers, 2014
2. S.S.Sastry, Introductory methods of Numerical Analysis, Prentice Hall of India Pvt. Ltd., 4th Ed., 2006

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DEPARTMENT OF CIVIL ENGINEERING

Subject	STRENGTH OF MATERIALS - II				
Year/semester	II B.Tech/II Sem	L	T	P	C
Regulation year	R - 20	3	0	0	3

Course Objectives:

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

Course Outcomes:

Upon successful completion of this course,

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

SYLLABUS

UNIT - I

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

UNIT – II

Torsion of Circular Shafts and Springs: Theory of pure torsion – Derivation of Torsion equations: $T/J = q/r = N\phi/L$ – Assumptions made in the theory of pure torsion – Torsional moment of resistance – Polar section modulus – Power transmitted by shafts – Combined bending and torsion and end thrust – Design of shafts according to theories of failure.

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

UNIT – III

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

UNIT – IV

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

UNIT – V

Unsymmetrical Bending and Shear Centre

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

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

Text books:

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

References:

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

VISHNU INSTITUTE OF TECHNOLOGY: BHIMAVARAM
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DEPARTMENT OF CIVIL ENGINEERING

Subject	HYDRAULICS AND HYDRAULIC MACHINERY				
Year/semester	II B.Tech/II Sem	L	T	P	C
Regulation year	R - 20	3	0	0	3

Course Objectives:

1. To study about uniform and non-uniform flows in open channel and also to learn about the characteristics of hydraulic jump
2. To introduce dimensional analysis for fluid flow problems
3. 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:

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

SYLLABUS

UNIT – I

Uniform Flow in Open Channel: Types of channels –Types of flows - Velocity distribution – Energy and momentum correction factors – Chezy's, and Manning's formulae for uniform flow – Most Economical sections, Critical flow: Specific energy-critical depth – computation of critical depth.

UNIT - II

Non-Uniform Flow in Open Channels: Steady Gradually Varied flow- Dynamic equation, Mild, Critical, Steep, horizontal and adverse slopes-surface profiles-direct step method- Rapidly varied flow, hydraulic jump, energy dissipation.

UNIT – III

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

UNIT – IV

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

UNIT – V

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

Pumps:

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

Reciprocating Pumps: Introduction, classification, components, working, discharge, indicator diagram, work done and slip.

Text Books:

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

References:

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

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DEPARTMENT OF CIVIL ENGINEERING

Subject	ENVIRONMENTAL ENGINEERING				
Year/semester	II B.Tech/II Sem	L	T	P	C
Regulation year	R - 20	3	0	0	3

Course Objectives:

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

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

Course Outcomes:

Course will enable the student to:

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

SYLLABUS

UNIT – I

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

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

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

UNIT – II

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

Removal of colour and odours- Removal of Iron and Manganese - Adsorption- Fluoridation and deflouridation–Reverse Osmosis- Freezing.

UNIT – III

Collection and Conveyance of Water: Factors governing the selection of the intake structure, Conveyance of Water: Gravity and Pressure conduits, Types of Pipes, Pipe Materials, Pipe joints, Design aspects of pipe lines. Laying and testing of pipe lines- Capacity of storage reservoirs, Mass curve analysis.

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

UNIT – IV

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

Sewer appurtenances – cleaning and ventilation of sewers.

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

Septic Tank - working Principles and Design.

UNIT – V

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

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

Text Books:

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

References:

1. Water Supply Engineering – P. N. Modi.
2. Water Supply Engineering – B. C. Punmia
3. Water Supply and Sanitary Engineering – G. S. Birdie and J. S. Birdie
4. Environmental Engineering (Vol.1) Water Supply Engineering - Santosh Kumar Garg, Khanna Publishers.
5. Sewage Disposal and Air Pollution Engineering by S.K. Garg, Khanna Publishers.
6. Waste Water Engineering by BC Punmia, Lakshmi publications Pvt lmtd.

VISHNU INSTITUTE OF TECHNOLOGY: BHIMAVARAM
(AUTONOMOUS)
DEPARTMENT OF CIVIL ENGINEERING

Subject	UNDERSTANDING HARMONY				
Year/semester	II B.Tech/II Sem	L	T	P	C
Regulation year	R - 20	2	1	0	3

Course Objectives:
The objective of the course is:

1. Development of a holistic perspective based on self-exploration about themselves (human being), family, society and nature/existence.
2. Understanding (or developing clarity) of the harmony in the human being, family, society and nature/existence
3. Strengthening of self-reflection.
4. Development of commitment and courage to act.

Course Outcomes:
By the end of the course, students are expected to become more aware of themselves, and their surroundings (family, society, nature); they would become more responsible in life, and in handling problems with sustainable solutions, while keeping human relationships and human nature in mind.
They would have better critical ability. They would also become sensitive to their commitment towards what they have understood (human values, human relationship and human society). It is hoped that they would be able to apply what they have learnt to their own self in different day-to day settings in real life, at least a beginning would be made in this direction.

Course Topics:
Module 1: Course Introduction - Need, Basic Guidelines, Content and Process for Value Education

1. Purpose and motivation for the course, recapitulation from Universal Human Values-I
2. Self-Exploration–what is it? - Its content and process; 'Natural Acceptance' and Experiential Validation- as the process for self-exploration
3. Continuous Happiness and Prosperity- A look at basic Human Aspirations
4. Right understanding, Relationship and Physical Facility- the basic requirements for fulfilment of aspirations of every human being with their correct priority
5. Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario
6. Method to fulfil the above human aspirations: understanding and living in harmony at various levels.

Include practice sessions to discuss natural acceptance in human being as the innate acceptance for living with responsibility (living in relationship, harmony and co-existence) rather than as arbitrariness in choice based on liking-disliking.

Module 2: Understanding Harmony in the Human Being - Harmony in Myself!

7. Understanding human being as a co-existence of the sentient 'I' and the material 'Body'
8. Understanding the needs of Self ('I') and 'Body' - happiness and physical facility
9. Understanding the Body as an instrument of 'I' (I being the doer, seer and enjoyer)
10. Understanding the characteristics and activities of 'I' and harmony in 'I'
11. Understanding the harmony of I with the Body: Sanyam and Health; correct appraisal of Physical needs, meaning of Prosperity in detail
12. Programs to ensure Sanyam and Health.
    Include practice sessions to discuss the role others have played in making material goods available to me. Identifying from one's own life. Differentiate between prosperity and accumulation. Discuss program for ensuring health vs dealing with disease.

Module 3: Understanding Harmony in the Family and Society- Harmony in Human-Human Relationship

13. Understanding values in human-human relationship; meaning of Justice (nine universal values in relationships) and program for its fulfilment to ensure mutual happiness; Trust and Respect as the foundational values of relationship
14. Understanding the meaning of Trust; Difference between intention and competence
15. Understanding the meaning of Respect, Difference between respect and differentiation the other salient values in relationship
16. Understanding the harmony in the society (society being an extension of family): Resolution, Prosperity, fearlessness (trust) and co-existence as comprehensive Human Goals
17. Visualizing a universal harmonious order in society- Undivided Society, Universal Order- from family to world family.

Include practice sessions to reflect on relationships in family, hostel and institute as extended family, real life examples, teacher-student relationship, goal of education etc. Gratitude as a universal value in relationships. Discuss with scenarios. Elicit examples from students' lives.

Module 4: Understanding Harmony in the Nature and Existence - Whole existence as Coexistence

18. Understanding the harmony in the Nature
19. Interconnectedness and mutual fulfilment among the four orders of nature- recyclability and self-regulation in nature
20. Understanding Existence as Co-existence of mutually interacting units in all-pervasive space
21. Holistic perception of harmony at all levels of existence.

Include practice sessions to discuss human being as cause of imbalance in nature (film "Home" can be used), pollution, depletion of resources and role of technology etc.

Module 5: Implications of the above Holistic Understanding of Harmony on Professional Ethics

22. Natural acceptance of human values
23. Definitiveness of Ethical Human Conduct
24. Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order
25. Competence in professional ethics: a. Ability to utilize the professional competence for augmenting universal human order b. Ability to identify the scope and characteristics of people friendly and eco-friendly production systems, c. Ability to identify and develop appropriate technologies and management patterns for above production systems
26. Case studies of typical holistic technologies, management models and production systems
27. Strategy for transition from the present state to Universal Human Order: a. At the level of individual: as socially and ecologically responsible engineers, technologists and managers b. At the level of society: as mutually enriching institutions and organizations
28. Sum up.

Include practice Exercises and Case Studies will be taken up in Practice (tutorial) Sessions eg. To discuss the conduct as an engineer or scientist etc.

Text Book:

1. Human Values and Professional Ethics by R R Gaur, R Sangal, G P Bagaria, Excel Books, New Delhi, 2010

Reference Books:

1. Jeevan Vidya: Ek Parichaya, A Nagaraj, Jeevan Vidya Prakashan, Amarkantak, 1999.
2. Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004.
3. The Story of Stuff (Book).
4. The Story of My Experiments with Truth - by Mohandas Karamchand Gandhi
5. Small is Beautiful - E. F Schumacher.
6. Slow is Beautiful - Cecile Andrews
7. Economy of Permanence - J C Kumarappa
8. Bharat Mein Angreji Raj – PanditSunderlal
9. Rediscovering India - by Dharampal
10. Hind Swaraj or Indian Home Rule - by Mohandas K. Gandhi
11. India Wins Freedom - Maulana Abdul Kalam Azad
12. Vivekananda - Romain Rolland (English)
13. Gandhi - Romain Rolland (English)

VISHNU INSTITUTE OF TECHNOLOGY: BHIMAVARAM
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DEPARTMENT OF CIVIL ENGINEERING

Subject	ENVIRONMENTAL ENGINEERING LABORATORY				
Year/semester	II B.Tech/II Sem	L	T	P	C
Regulation year	R - 20	0	0	3	1.5

Course Objectives:

The course will address the following:

1. Estimation of important characteristics of water and wastewater in the laboratory
2. Inference with reference to the significance of the characteristics of the water and wastewater.

Course Outcomes:

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

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

List of Experiments:

1. Determination of pH and Electrical Conductivity (Salinity) of Water and Soil.
2. Determination and estimation of Total Hardness–Calcium &Magnesium in water.
3. Determination of P&M Alkalinity/Acidity
4. Determination of Chloride in water and soil
5. Determination and Estimation of total solids, organic solids and inorganic solids and Settleable Solids by Imhoff Cone.
6. Determination of Dissolved Oxygen with D.O. Meter &Wrinklers Method and BOD.
7. Physical parameters – Temperature, Colour, Odour, Turbidity and Taste.
8. Determination of C.O.D.
9. Determination of Optimum coagulant dose- with and without coagulant aids
10. Determination of Chlorine residue and demand
11. Presumptive Coliform test.

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

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

List of Equipment's:

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

Text Books:

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

Reference:

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

VISHNU INSTITUTE OF TECHNOLOGY: BHIMAVARAM
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DEPARTMENT OF CIVIL ENGINEERING

Subject	STRENGTH OF MATERIALS LABORATORY				
Year/semester	II B.Tech/II Sem	L	T	P	C
Regulation year	R - 20	0	0	3	1.5

Course Objectives:

The course will address the following:

1. To determine experimental data for spring testing machine, compression testing machine, impact tester, hardness tester.
2. To determine stress analysis and design of beams subjected to bending.

Course Outcomes:

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

1. Analyze and design structural members subjected to tension& compression
2. Understand the basic concepts of stress, strain, deformation, and material behaviour under different types of loading
3. Calculate the stresses and strains in axially-loaded members
4. Ability to conduct tension tests.

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

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

VISHNU INSTITUTE OF TECHNOLOGY: BHIMAVARAM
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DEPARTMENT OF CIVIL ENGINEERING

Subject	FLUID MECHANICS AND HYDRAULIC MACHINERY LABORATORY				
Year/semester	II B.Tech/II Sem	L	T	P	C
Regulation year	R - 20	0	0	3	1.5

Course Objectives:

1. To calibrate the various discharge measuring instruments for flow through pipes.
2. To determine the coefficient of discharge through small orifice and mouth piece
3. To calibrate the notches for discharge measurement for flow through open channels.
4. To determine the friction factor and losses for flow through pipes
5. To verify the Bernoulli's theorem.

Course Outcomes:

1. Apply the theoretical principles in calibrating the flow measuring devices used in pipes, channels and tanks.
2. Understand the concept of friction factor and losses through pipes.

List of Experiments:

1. Calibration of Venturi meter & Orifice meter
2. Determination of Coefficient of discharge for a small orifice and mouth piece by a constant head and variable head method.
3. Calibration of contracted Rectangular Notch and /or Triangular Notch
4. Determination of Coefficient of loss of head in a sudden contraction and friction factor.
5. Verification of Bernoulli's equation.
6. Impact of jet on vanes
7. Study of Hydraulic jump.
8. Performance test on Pelton wheel turbine
9. Performance test on Francis turbine.
10. Efficiency test on centrifugal pump.
11. Efficiency test on reciprocating pump.

List of Equipment:

1. Venturi meter setup.
2. Orifice meter setup.
3. Small orifice setup.
4. External mouth piece setup.
5. Rectangular and Triangular notch setups.
6. Friction factor test setup.

7. Bernoulli's theorem setup.
8. Impact of jets.
9. Hydraulic jump test setup.
10. Pelton wheel, Francis turbine and Kaplan turbines
11. Centrifugal and Reciprocating pumps.

VISHNU INSTITUTE OF TECHNOLOGY: BHIMAVARAM
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DEPARTMENT OF CIVIL ENGINEERING

Subject	ADVANCED CONSTRUCTION PLANNING LABORATORY				
Year/semester	II B.Tech/II Sem	L	T	P	C
Regulation year	R - 20	1	0	2	2

Course Objectives:

By the end of this course the students are expected

1. To understand the fundamental principles and concepts of building by-laws planning and architecture for buildings.
2. To study about different views of layout plans within the field.
3. To gain knowledge on concepts of Vastu.

Course outcomes:

By the end of this course students will be able to

1. Understand the fundamentals of latest building by-laws.
2. Understand various Vastu concepts in construction practices.
3. Prepare working drawings and other executable drawings with proper details for Commercial buildings and execute drawings for Plots.
4. Prepare the blueprint models ofresidential building plans.

List of experiments:

1. Introduction to building by-laws as per latest G.O.
2. Concepts of Vastu landscape and interior design practices.
3. Evaluation, measurement and drawing of Commercial buildings.
4. Evaluation, measurement and drawing of Plots and layouts with in the given field.
5. Preparation of a blueprint model of G+1 storey residential building plan as per by-laws.

VISHNU INSTITUTE OF TECHNOLOGY: BHIMAVARAM
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DEPARTMENT OF CIVIL ENGINEERING

Subject	CRITICAL READING AND CREATIVE WRITING				
Year/semester	II B.Tech/II Sem	L	T	P	C
Regulation year	R - 20	3	0	0	0

Course objectives:

The students will have the ability to

1. Understand how to identify, analyze, interpret and describe critical ideas, themes, and values in literary texts
2. List the elements of a Short Story
3. Apply critical and theoretical approaches to the reading and analysis of literary texts in multiple genres

Course Outcomes:

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

1. Understand and explain the characteristics of a literary text
2. Critically analyze the quality of a Shorty Story
3. Produce essays like personal essay or descriptive essay applying the principles of good writing
4. Identify facts, themes and critical ideas in a passage
5. Articulate an awareness of the basic elements of a speech

SYLLABUS

UNIT – I

Essentials of Good Writing

1. Focus, Development, Unity, Coherence and Correctness
2. Imagery
   A. Figurative Language- Simile, Metaphor, Personification, Hyperbole, Oxymoron, Paradox, Alliteration, Assonance
   B. Sensory details
3. Point of View

UNIT – II

Elements of a Short story

1. Plot, Setting, Character, Theme
2. Analysis of given short stories: 2 stories

A. Good Sees the Truth but Waits by Leo Tolstoy
B. The Cop and the Anthem by O. Henry

UNIT – III

Prose Writing:

Reflective Writing – Personal Essay
Descriptive Writing: Person/Place/Thing

UNIT – IV

Reading Comprehension

Reading for facts, contextual vocabulary, tone and inference

UNIT – V

Speech Analysis

A. Tryst with Destiny- https://www.youtube.com/watch?v=lrEkYscgbqE
B. Stay Hungry, Stay Foolish – https://www.youtube.com/watch?v=UF8uR6Z6KLc

References:

The Cambridge Companion to Creative Writing (South Asian Edition)

Creative Writing: A Beginner's Manual (Paper Back Edition)

Teaching and Developing Reading Skills: Cambridge Handbooks for Language Teachers

Web References:

https://www.skillsyouneed.com/learn/critical-reading.html

https://englishforeveryone.org

http://sixminutes.dlugan.com/speech-evaluation-1-how-to-study-critique-speech/

http://www.homeofbob.com/literature/genre/fiction/ficElmnts.html

VISHNU INSTITUTE OF TECHNOLOGY: BHIMAVARAM
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DEPARTMENT OF CIVIL ENGINEERING

Course Structure – R20
(With effect from 2020-2021)

III Year - I Semester

S.No.	Category	Course Title	L	T	P	C	IM	EM	TM
1	PCC	Structural Analysis	3	-	-	3	30	70	100
2	PCC	Geotechnical Engineering-I	3	-	-	3	30	70	100
3	PCC	Design & Drawing of Reinforced Concrete Structures	3	1	-	3	30	70	100
4	OEC/JOE-I	Elements of Civil Engineering Advanced Concrete Technology	3	-	-	3	30	70	100
5	PEC-I	Air Pollution And Control Remote Sensing & GIS Applications Traffic Engineering Low Cost Housing	3	-	-	3	30	70	100
6	PCC LAB	Geotechnical Engineering Laboratory	-	-	3	1.5	15	35	50
7	PCC LAB	Remote Sensing & GIS Laboratory	-	-	3	1.5	15	35	50
8	SOC/SSC	Advanced English Communication Skills Laboratory	-	-	4	2	15	35	50
9	MC	Engineering Exploration Project	-	-	2	-	-	-	-
10		Summer Internship 2 months (To be completed after second year and evaluated during V semester)	-	-	-	1.5	50	-	50
Total			**15**	**1**	**12**	**21.5**	**245**	**455**	**700**

VISHNU INSTITUTE OF TECHNOLOGY: BHIMAVARAM
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DEPARTMENT OF CIVIL ENGINEERING

Subject	STRUCTURAL ANALYSIS				
Year/semester	III B.Tech / I Sem	L	T	P	C
Regulation year	R - 20	3	1	0	3

Course Objectives:

1. 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.
2. The procedure for development of slope deflection equations and moment distribution method to solve application to continuous beams with and without settlement of supports.
3. Equip student with concepts of Arches.

Course Outcomes:

1. Distinguish between the determinate and indeterminate structures
2. Estimate the bending moment and shear forces in beams for different fixity conditions.
3. Analyze the continuous beams using various methods - three moment method, energy theorems.
4. Analyze structures using slope deflection method & Moment Distribution.
5. Analyze the three hinged arches and its bending moment and shear moment.

SYLLABUS:

UNIT – I

Introduction: Determinate and Indeterminate Structures, Static Indeterminacy, Degrees of freedom, Redundancy.

Propped Cantilever: Introduction to propped cantilever beam, Analysis of propped cantilevers - shear force and bending moment diagram - Deflection of propped cantilevers.

UNIT – II

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

UNIT – III

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.

UNIT – IV

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

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

Three Hinged Arches: Introduction to Arches, Arch Action, Advantage of Arches, Classification of Arches by Shape, Material, Number of hinges, Elastic theory of arches – Eddy's theorem – Determination of horizontal thrust, bending moment, normal thrust and radial shear – effect of temperature. Hinges with supports at different levels.

Text Books:

1. C. S. Reddy, "Basic Structural Analysis", Tata Mc.Graw-Hill, New Delhi.
2. T.S. Thandavamoorthy, "Analysis of Structures" , Oxford University Press, New Delhi
3. V. N. Vazirani and M. M. Ratwani, "Analysis of Structures" - Vol. I and II, Khanna Publishers, New Delhi.
4. R.C. Hibbeler, "Structural Analysis", Pearson Education, India.

References:

1. B. C Punmia, "Theory of Structures", A. K Jain & Arun K. Jain, Lakshmi Publications.
2. Ramamuratam, "Theory of structures", Dhanpatrai Publications.
3. William M.C. Mckenzie, "Examples in Structural Analysis", Taylor & francis.

VISHNU INSTITUTE OF TECHNOLOGY: BHIMAVARAM
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DEPARTMENT OF CIVIL ENGINEERING

Subject	GEOTECHNICAL ENGINEERING-I				
Year/semester	III B.Tech/I Sem	L	T	P	C
Regulation year	R - 20	3	0	0	3

Course Objectives:
The Objectives of this course are:

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

Course Outcomes:
Upon the successful completion of this course

1. Acquaint with physical properties and classification of soils.
2. Find coefficient of permeability and equivalent hydraulic conductivity in stratified soils and find critical hydraulic gradient.
3. Find vertical stresses in soils subjected to point, line, strip, circular, rectangular and irregular shape of loadings.
4. Perform laboratory compaction test to determine the maximum dry density and optimum moisture content of the soil and know field methods of compaction and their quality.
5. Find the time-dependent settlement of a soil deposit subjected to loads and Estimate shear parameters and shear strength of soils.

SYLLABUS:

UNIT – I

Introduction: Soil formation – soil structure and clay mineralogy – Adsorbed water – Phase diagram - Basic terms, Functional relationships based on index properties - Mass- volume relationship – Relative density

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

UNIT –II

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

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

UNIT – III

Stress Distribution In Soils: Stresses induced by applied loads - Pressure Bulb, Stress distribution under a point load on horizontal and vertical planes - Boussinesq's and Westergaard's theories for point loads and areas of different shapes – Newmark's influence chart – 2:1 stress distribution method.

UNIT – IV

Compaction: Mechanism of compaction – factors affecting – effects of compaction on soil properties - compaction control - Field compaction control.
Consolidation: Types of compressibility - Immediate Settlement, primary consolidation and secondary consolidation - stress history of clay; e-p and e-log p curves - Normally consolidated soil, over consolidated soil and under consolidated soil – Pre-consolidation pressure and its determination - Terzaghi's 1-D consolidation theory - Coefficient of consolidation: Square root time and Logarithm of time fitting methods - Computation of total settlement and time rate of settlement

UNIT – V

Shear Strength of Soils: Importance of shear strength - Mohr's - Coulomb Failure theories - Types of laboratory tests for strength parameters - Strength tests based on drainage conditions - strength envelops - Shear strength of sands - Dilatancy - Critical void ratio - Liquefaction - Shear strength of clays.

Text Books:

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

References:

1. D.W.Taylor, "Fundamentals of Soil Mechanics", Wiley.
2. Holtz and Kovacs, "An introduction to Geotechnical Engineering" Prentice Hall.
3. Donald P. Coduto, "Geotechnical Engineering", Second Edition, By Pearson.

VISHNU INSTITUTE OF TECHNOLOGY: BHIMAVARAM
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DEPARTMENT OF CIVIL ENGINEERING

Subject	DESIGN AND DRAWING OF REINFORCED CONCRETE STRUCTURES				
Year/semester	III B.Tech / I Sem	L	T	P	C
Regulation year	R - 20	3	1	0	3

Course Objectives:
The objective of this course is:

1. To design structures using limit state analysis.
2. To know various elements of a reinforced concrete structures.
3. To design RC structural elements as per IS code provisions.

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

1. Work on different types of design methods.
2. Analysis and design of flexural members, design of structures subjected to shear, bond and torsion.
3. Distinguish and design the one-way and two-way slabs.
4. Design the axially loaded, uni-axial and bi-axial bending columns.
5. Classify the footings and Design the isolated square, rectangular and circular footings.

SYLLABUS:

UNIT – I

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

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

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

UNIT – II

Design for Flexure: Introduction to beams, Design of singly reinforced beams- effective depth- Moment of Resistance- Doubly reinforced and flanged (T) beams- Minimum depth - Minimum and Maximum Flexural Tension Reinforcement - Design of Flanged Sections (T) - Effective width of flange - Analysis and Design Problems.

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

UNIT – III

Slabs and Serviceability: Introduction to slabs, Classification of slabs, design of one - way slabs, one way continuous slab using IS Coefficients (Conventional) –Design of two - way slabs - simply supported slabs and slabs with various edge conditions using IS Coefficients. Introduction to waist-slab staircase.

Limit state of serviceability: Deflection – long term & short term, cracking and IS code provisions for beams and slabs.

UNIT – IV

Design of Compression members: Introduction to compression members, Effective length, Braced and un-braced columns – Indian Standard Code provisions, Design of short and long columns under axial loads, uni-axial bending and bi-axial bending (Demonstration using Special Publication 16)

UNIT – V

Footings: Introduction to footings, Types of footings – Design of isolated footings – pedestal, square, rectangular and circular footings subjected to axial loads both uni-axial and bi-axial bending.

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

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

Final Examination Pattern:

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

Text Books:

1. A. K.Jain, “Limit State Design”, Nem Chand Brothers.

2. N. Krishna Raju & R. N. Pranesh, "Reinforced Concrete Structures", New Age Publications.
3. N.Krishna Raju, "Structural Design and Drawing", Universities Press.

References:

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

IS Codes: (Permitted to use in examination hall)

1. Indian Standard - 456-2000 Code of practice for Plain & Reinforced Concrete Structures.
2. Indian Standard – 875 (Parts 1 and 2) Code of Practice for Design Dead Loads & Live Loads (Other than Earthquake) for Buildings and Structures.
3. Special Publication - 16, Design Aids for Reinforced Concrete to IS: 456-1978.
4. Special Publication – 34, Handbook on Functional Requirements of Industrial Buildings (Lighting and Ventilation)

VISHNU INSTITUTE OF TECHNOLOGY: BHIMAVARAM
(AUTONOMOUS)
DEPARTMENT OF CIVIL ENGINEERING

Subject	OEC/JOE-I: (a) ELEMENTS OF CIVIL ENGINEERING				
Year/semester	III B.Tech / I Sem	L	T	P	C
Regulation year	R - 20	3	0	0	3

Course Objectives:

1. To know the different fields of Civil Engineering, Building Materials and structural Elements**.**
2. To expose a wide range of concepts in steel connections and pre-stressed members.
3. To provide basic fundamental knowledge on Transportation Engineering, Environmental engineering.

Course Outcomes:

1. To impart basic knowledge on civil engineering materials.
2. To explore basic knowledge on building construction materials.
3. The students will be able to analyze the material on the basis of their properties and thus assigning different weight age to their use for technical purposes and to provide exposure on the fundamental elements of civil engineering structures.
4. To explore the knowledge on steel connections and pre-stressed members.
5. The student will be able to know about pavements and water treatment methods.

SYLLABUS:

UNIT – I

Civil Engineering Materials:

Traditional materials: Stones-Bricks-Lime-Cement-Timber

Mortars: Sand -Cement Mortar-Lime Mortar-Mud Mortar-Special Mortar-Tests on Mortar

Concrete: Plain Concrete-Reinforced Cement Concrete (R.C.C.)-Reinforced Brick Concrete (RBC) - Pre-stressed Concrete (PSC) - Fibre-Reinforced Concrete (FRC) Cellular Concrete-Ferro-Cement

Metals as building materials: Ferrous Metals-Aluminium-Copper

Miscellaneous building materials: Glass-Plastics – Bitumen – Asbestos – Paints – Distempers – Varnishes - Solid and Hollow Concrete Blocks - Roofing and Flooring Tiles.

UNIT – II

Building Construction:

Building planning: Elements of a Building-Basic Requirements of a Building-Planning-Planning Suitable Orientation-Planning for Energy Efficiency-Planning for Suitable Utility-Planning for Meeting Other Requirements

Foundations: Dimensions of Foundation - Conventional Spread Footings - R.C.C. Footings - Grillage Footing Arch Foundation - Pile Foundations - Foundations in Black Cotton Soil.

Super structures: Types of Super Structures Based on the Method of Load Transfers – Walls - Stone Masonry - Brick Masonry – Plastering – Pointing – Flooring – Roof - Doors and Windows – Lintels – Stairs.

UNIT – III

Concrete Structures: Introduction to RCC structures, Materials, permissible stresses and IS Specifications; Working stress methods; Limit State Method - Stress Blocks parameters.

UNIT – IV

Steel Structures: Introduction to steel structures, Properties of steel sections, permissible stresses, IS Specifications; Riveted and welded joints and bolted connections.

Pre-Stressed Concrete: Introduction to Pre-Stressed structures, Basic concepts, material for pre-stressing, losses in Prestress, classification of pre-stressing system.

UNIT – V

Roads: Benefits- Classifications - Traffic signs, Bridges-components of Bridges – Dams and its Types, Purpose of reservoir.

Environmental Engineering: Protected water supply, water treatment methods- sewage treatment- Pollution-Types-causes-remedial measures.

Text Books:

1. Dr. B.C. Punmia, “Basic Civil Engineering”, Ashok Kumar Jain, Arun Kr. Jain,/Laxmi Pulications.
2. S Shanmugam/Ms Palanichamy, “Basic civil and Mechanical Engineering” , Mc Graw Hill

Reference Books:

1. SS Bhavikatti, “Basic civil Engineering” –. New Age International publishers
2. Nevile, “Properties of concrete” , Longman publishers

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DEPARTMENT OF CIVIL ENGINEERING

Subject	OEC/JOE-I: (b) ADVANCED CONCRETE TECHNOLOGY				
Year/semester	III B.Tech / I Sem	L	T	P	C
Regulation year	R - 20	3	0	0	3

Course Objectives:

1. To understand the properties of ingredients of concrete.
2. To study the behavior of concrete at its fresh and hardened state.
3. To study about the concrete design mix and to know about the procedures in concrete at different stage.

Course Outcomes:

On completion of this course, the students will be able to

1. Identify quality control tests on concrete making materials.
2. Design concrete mixes as per IS and ACI codes.
3. Understand the behaviour of fresh and hardened concrete.
4. Design high strength concrete and their specific applications and use of admixtures.
5. Understand the need for special concretes

SYLLABUS:

UNIT – I

Concrete Making Materials: Cement – Bogus Compounds – Hydration Process – Types of Cement – Aggregates – Gradation Charts – Combined Aggregate – Alkali Silica Reaction – Admixtures – Chemical and Mineral Admixtures.

UNIT – II

Mix Design: Factors influencing mix proportion, Mix design by ACI method and I.S. code method, Design of high strength concrete.

UNIT – III

Durability of concrete : Shrinkage and creep of concrete, permeability of concrete, Acid Attack, Thermal properties of concrete, Micro cracking of concrete, Corrosion Causes effects and remedial measures.

Properties of Concrete:

Fresh concrete: Workability, Compaction Factor, Vee Bee time.

Hardened concretes: Cube Strength, Cylindrical Strength, Flexural Strength and Non-Destructive Testing.

UNIT – IV

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

UNIT – V

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

Text Books:

1. Shetty, M.S., "Concrete Technology", Theory & Practice, S.Chand and Co.

2. Gambhir, M.L., "Concrete Technology", Tata McGraw Hill

3. Santakumar A.R., "Concrete Technology", Oxford University Press, New Delhi.

References:

1. Nevile, "Properties of Concrete", Longman Publishers.

2. Indian Standard: 10262-2009 Code of Practice for concrete Mix Design.

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Subject	PEC-I: (a) AIR POLLUTION AND CONTROL				
Year/semester	III B.Tech/I Sem	L	T	P	C
Regulation year	R - 20	3	0	0	3

Course Objectives:

1. To study sources and classification of air pollution and understand fundamentals of meteorology and stability of atmosphere.
2. To learn about the different air pollutants and control.
3. To know the air pollution legislation and regulations.

Course Outcomes:

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

1. Identify sources and types of air pollutants.
2. Understand meteorological effect on air quality changes.
3. Choose the appropriate techniques for removal of particulate pollutants.
4. Choose the appropriate techniques for removal of gaseous pollutants.
5. Understand air pollution legislations and regulations.

SYLLABUS:

UNIT - I

Sources And Classification Of Air Pollution: Introduction; Definitions; Significance; Types of pollutants; Sources and impacts on plants, animals, materials; Classifications - natural and artificial, primary and secondary, point and non-point, linear and areal sources, stationary and mobile; Ambient air quality standards by World Health Organization(WHO) and Central Pollution Control Board (CPCB)

UNIT – II

Air Pollution Meteorology: Composition and structure of the atmosphere; Atmospheric dispersion- Pressure, Wind, Moisture; Meteorological factors influencing air - heat, pressure, wind forces, moisture and relative humidity; Lapse rates – Environmental Lapse rate, Adiabatic Lapse rate; Influence of terrain and meteorological phenomenon on plume behaviour and air quality; Wind rose diagrams.

UNIT – III

Particulate Matter And Control: Sources; Emission factors; Control techniques - control at sources, process changes, equipment modifications; Control Equipment - Working Principles and Operation – Settling chambers, Cyclone separators, Fabric filters, Scrubbers, Electrostatic precipitators.

UNIT – IV

Gaseous Pollutants And Control: Control of gaseous pollutants – Modification of operating conditions, modification of design conditions; Effluent gas treatment methods – Combustion-Direct flame combustion, Thermal Combustion, Catalytic Combustion; Absorption – Spray towers, Packed towers; Adsorption – Types of adsorbents, Multiple Fixed bed adsorber, Fluidized adsorber bed, Condensation – Surface Condenser, Contact Condenser; Air-fuel Ratio.

UNIT – V

Air Pollution Legislation And Regulations: The Air (Prevention and Control of Pollution) Act, 1981 - Constitution of the Board, Functions of Central and State Board, Emission Standards, Penal Provisions of the Act; Case studies – Bhopal gas Tragedy, London Smog, and Present Scenario of Delhi.

Text Books:

1. Air Pollution, M.N. Rao and H.V.N. Rao, 1st Edition, McGraw Hill Education.
2. Air Pollution and Control, K.V.S.G. Murali Krishna, 1st Edition, University Science Press, Laxmi Publisher.
3. S.K. Garg, Sewage Disposal and Air Pollution Engineering, Environmental Engineering Vol. II, Khanna Publishers.

Reference Books:

1. Y. Anjaneyulu and V. Manickam, “Environmental Impact Assessment Methodologies”, 2 nd edition, B.S. Publication.
2. Peavy, H.S, Rowe, D.R., and G. Tchobanoglous, Environmental Engineering, McGraw Hill Inc., New York, 2017.

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DEPARTMENT OF CIVIL ENGINEERING

Subject	PEC-I: (b) REMOTE SENSING AND GIS APPLICATIONS				
Year/semester	III B.Tech/I Sem	L	T	P	C
Regulation year	R - 20	3	0	0	3

Course 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 and appreciate application of RS and GIS to Civil Engineering.
3. Learn concepts of visual and digital image analyses and understand the principles of spatial analysis

Course outcomes:

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

1. Be familiar with ground, air and satellite-based sensor platforms.
2. Interpret the aerial photographs and satellite imageries
3. Create and input spatial data for GIS application
4. Apply RS and GIS concepts on land surfaces.
5. Apply RS and GIS concepts for Hydrology and Water Resources.

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 pre-processing, image enhancement, image classification, supervised classification, unsupervised classification: Overlay function-vector overlay operations; raster overlay operations, network analysis.

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

RS and GIS applications General: Land cover and land use, agriculture, forestry, geology, geomorphology, urban & transportation applications,

UNIT - V

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

Text Books:

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

References:

1. Narayan LRA, 'Remote Sensing and its Applications', Universities Press, 2012.
2. 'Concepts and Techniques of Geographical Information System' by Chor Pang Lo and AKW Yeung, Prentice Hall (India), 2006

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DEPARTMENT OF CIVIL ENGINEERING

Subject	PEC-I: (c) TRAFFIC ENGINEERING				
Year/semester	III B.Tech/I Sem	L	T	P	C
Regulation year	R - 20	3	0	0	3

Course Objectives:

1. To introduce fundamental knowledge of traffic engineering so that students can understand and be able to deal with traffic issues including safety, planning and design.
2. To introduce fundamental knowledge of traffic engineering so that students can understand and be able to deal with traffic issues including operation and control.
3. Students will learn and be able to use software such as Highway Capacity Software and Synchro in traffic engineering projects.

Course Outcomes:

Students who successfully complete this course will be able to:

1. Use statistical concepts and applications in traffic engineering.
2. Identify traffic stream characteristics.
3. Understand elements of highway safety and approaches to accident Studies.
4. Design a pre-timed signalized intersection, and determine the signal splits.
5. Identify level of services for arterials.

SYLLABUS:

UNIT – I

Introduction: Significance and scope, Characteristics of Vehicles and Road Users, Skid Resistance and Braking Efficiency (Problems), Fundamentals of traffic flow, urban traffic problems in India**.** Components of Traffic Engineering- Road, Traffic and Land Use Characteristics.

UNIT – II

Traffic Surveys and Analysis: Surveys and Analysis - Volume, Capacity, Speed studies and Delays, Origin and Destination, Parking, Pedestrian Studies, Accident Studies and Safety Level of Services- Problems, Statistical Applications in Traffic Engineering.

UNIT – III

Traffic Control: Traffic signs, Road markings, Design of Traffic signals and Signal co-ordination (Problems), Traffic control aids and Street furniture, Street Lighting, Computer applications in Signal design.

UNIT – IV

Geometric Design Of Intersections: Conflicts at Intersections, Classification of Intersections at Grade, - Chanallised and Unchanallised Intersection - Grade Separators (Concepts only), Principles of Intersection Design, Elements of Intersection Design, Chanallisation and Rotary design (Problems), Grade Separators.

UNIT – V

Traffic Management: Traffic Management- Traffic System Management (TSM) and Travel Demand Management (TDM), Traffic Forecasting techniques, Restrictions on turning movements, One-way Streets, Traffic Segregation, Traffic Calming, Tidal flow operations, Exclusive Bus Lanes - Introduction to Intelligence Transport System (ITS)

Text Books:

1. Khanna K and Justo C E G, Highway Engineering, Khanna Publishers, Roorkee, 2001.
2. Kadiyali L R, Traffic Engineering and Transport Planning, Khanna Technical Publications, Delhi, 2000.
3. Paul H. Wright and Karen K. Dixon, Highway Engineering, 7th Edition, Wiley Student, Edition, 2009.

References:

1. YoderE.J., WitczakM.W., Principles of Pavement Design, John Wiley & Sons–Indian edition.2008
2. Indian Roads Congress (IRC) specifications: Guidelines and special publications on Traffic Planning and Management.
3. Guidelines of Ministry of Road Transport and Highways, Government of India.

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DEPARTMENT OF CIVIL ENGINEERING

Subject	PEC-I: (d) LOW COST HOUSING				
Year/semester	III B.Tech/I Sem	L	T	P	C
Regulation year	R - 20	3	0	0	3

Course Objectives:

1. To provide the students with in-depth knowledge of various building materials, in Low Cost Housing.
2. To provide the students with in-depth knowledge of various building constructions in Low Cost Housing.
3. To provide the students with in-depth knowledge of various building execution techniques in Low Cost Housing.

Course Outcomes:

1. Comprehend the current Housing Situation in India, various Developmental Programmes with the gained knowledge and understand the application of sustainable building material including their cost implications.
2. Understand the fundamentals of Modular coordination and its application in both in total & partial prefab construction technology, Analyze the merits & demerits of the impact of prefab/precast application in terms of employment and production.
3. Apply the cost reduction solutions developed by National Institutions for a given assignment.
4. Gain and understand the use of CPM & PERT in project management analyze the time cost relationship and its application to overcome the time overrun losses in the project management cycle.
5. Able to synthesize the knowledge gained in terms of material and techniques for optimum output of speedy construction and cost reduction. Knowledge of ongoing research in low-cost building materials and construction technologies at both the National & International level.

SYLLABUS:

UNIT - I

Introduction to Low Cost Housing: Introduction to low cost housing, building components influencing cost of buildings. Adobe, Cob, Rammed earth, Straw bale, Bamboo, earthen finishes, etc., their sustainability, adaptability to local climate, engineering considerations necessary for durability.

UNIT - II

Modular Coordination: Modular coordination in building design, total and partial prefabrication, impact of prefabrication on employment. Various methods of mass production of building components. Necessity of Massive Evacuation and Rehabilitation and rebuilding colonies with examples like major project sites, Earthquake effected colonies.

UNIT – III

Low Cost Construction Technologies: Building construction technology solutions for cost reduction. Available knowledge in low cost construction technologies, Institutions developing low cost construction technologies like BMTPC, CBRI, Auroville Building Center, etc.

UNIT - IV

Time Cost Management: Use of CPM and PERT methods in building construction management. Effect of time-cost relationship in low cost housing delivery mechanism.

UNIT - V

Building Cost Reduction: Application of low-cost building materials and various construction techniques, building cost control techniques, research and development by various organizations in the country and foreign countries to reduce the cost.

Text Books:

1. Davis, S. “Architecture of Affordable Housing”, University of California Press,1995.

2. Ruiz, F. P. “Building an Affordable House, Taunton Press,1995.

3. Laul, A. K. “A Handbook of Low-Cost Housing”, New Age International,1995.

4. Mathur, G. C. “Low Cost Housing in Developing Countries”, South Asia Book,1999.

References:

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

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DEPARTMENT OF CIVIL ENGINEERING

Subject	GEOTECHNICAL ENGINEERING LABORATORY				
Year/semester	III B.Tech/I Sem	L	T	P	C
Regulation year	R - 20	0	0	3	1.5

Course Objectives:

The objective of this course is:

1. To determine the index properties for soil classification – Grain size distribution & Atterberg's limits.
2. To determine the engineering properties – Permeability, Compaction, consolidation, shear strength parameters& CBR value.
3. To teach how to determine compaction characteristics and consolidation behaviour from relevant lab tests; to determine permeability of soils.

Course Outcomes:

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

1. Site specific field investigations including collection of soil samples for testing and observation of soil behaviour/building damage.
2. Identify and classify soil based on standard geotechnical engineering practice.
3. Determine the Relative Compaction based on field density and laboratory density and Permeability of the soil.
4. The strength of the soil depending on the drainage conditions and type of the soil
5. Determine co-efficient of consolidation and settlement of fine-grained soil.

LIST OF EXPERIMENTS:

1. Specific gravity, G & Differential free swell (DFS)
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 and Field CBR
8. Direct Shear test & Vane Shear test
9. Triaxial Compression test
10. Unconfined Compression test

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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. Permeability apparatus for
   a) Constant head test
   b) Variable head test
6. Universal auto compactor for I.S light and heavy compaction tests.
7. Shaking table, funnel for sand raining technique.
8. Apparatus for CBR test
9. 10 tons loading frame with proving rings of 0.5 tons and 5 tons capacity
10. One dimensional consolation test apparatus with all accessories.
11. Triaxial cell with provision for accommodating 38 mm dia specimens.
12. Box shear test apparatus
13. Laboratory vane shear apparatus.
14. Hot air ovens (range of temperature 500 - 1500C)

References:

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

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DEPARTMENT OF CIVIL ENGINEERING

Subject	REMOTE SENSING & GIS LABORATORY				
Year/semester	III B.Tech/I Sem	L	T	P	C
Regulation year	R - 20	0	0	3	1.5

Course Objectives:

The course is designed to

1. Understand the process Geo-referencing, Preparation of Base map from of Toposheet.
2. Digitization, creation of thematic maps from toposheets and to developing Digital Elevation model
3. Interpretation and Estimation of features of Land Use/land cover details from satellite imagery and to apply GIS software to simple problems in water resources, transportation engineering and Agriculture

Course Outcomes:

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

1. Work comfortably on GIS software
2. Digitize and create thematic map and extract important features
3. Develop digital elevation model
4. Interpretation and Estimation of features from satellite imagery.
5. Analyze and Modelling using GIS software.

GIS SOFTWARES:

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

EXCERCISES IN GIS:

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

Text Book:

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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DEPARTMENT OF CIVIL ENGINEERING

Subject	ADVANCED COMMUNICATION SKILLS LABORATORY				
Year/semester	III B.Tech/I Sem	L	T	P	C
Regulation year	R - 20	0	0	4	2

Course Objectives:

1. To expose students to different contexts through right vocabulary.
2. To inculcate the habit of reading and understanding any text.
3. To enable students to acquire the ability of writing for business purposes and to enable students to acquire interview skills and group discussion dynamics.

Course Outcomes:

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

1. Choose vocabulary contextually.
2. Comprehend, analyze and interpret the text in a definite time frame.
3. Write resumes cohesively and coherently.
4. Construct and elaborate on a given topic and Comprehend and practice the dynamics of group discussion.
5. Comprehend the concept and process of interview; answering through mock interviews.

SYLLABUS:

UNIT – I

Selected High GRE Words, Idioms & Phrases – Discourse Skills – using visuals – Synonyms and antonyms, word roots, one word substitutes, prefixes and suffixes, study of word origin, analogy, idioms and phrases, collocations.

UNIT – II

Reading Comprehension – General Vs Local Comprehension, reading for facts, guessing meanings from context, scanning, skimming, inferring meaning.

UNIT – III

Writing Skills – Structure of Resume writing – Short Report Writing (Business/Technical)

UNIT – IV

Presentation Skills -Group Discussion – Dynamics of Group Discussion

UNIT – V

Interview Skills – Concept and process – pre-interview planning, opening strategies, answering strategies, interview through teleconference & video-conference and mock interviews.

Suggested Software:

1. K-Van solutions Software with CD
2. Oxford advanced learner's compass, 7th Edition

Suggested Reading:

1. Technical Communication by Meenakshi Raman & Sangeeta Sharma, Oxford University Press 2009.
2. Business and Professional Communication: Keys for Workplace Excellence. Kelly M. Quintanilla & Shawn T. Wahl. Sage South Asia Edition. Sage Publications. 2011.
3. English Vocabulary in Use Series, Cambridge University Press 2008.
4. Communication Skills by Leena Sen, PHI Learning Pvt. Ltd., New Delhi, 2009.
5. A Course Book of Advanced Communication Skills Lab published by University Press, Hyderabad.

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DEPARTMENT OF CIVIL ENGINEERING

Course Structure – R20
(With effect from 2020-2021)

III Year - II Semester

S.No.	Category	Course Title	L	T	P	C	IM	EM	TM
1	PCC	Design and Drawing of Steel Structures	3	1	-	3	30	70	100
2	PCC	Water Resource Engineering	3	-	-	3	30	70	100
3	PCC	Geotechnical Engineering-II	3	-	-	3	30	70	100
4	PEC-II	Architecture & Town Planning Road Safety Engineering Advanced Structural Analysis Precast and Prefabricated Structures	3	-	-	3	30	70	100
5	OEC/JOE –II	Basics of Environmental engineering Innovative Construction Materials	3	-	-	3	30	70	100
6	PCC LAB	Surveying Field Work- II (Laboratory)	-	-	3	1.5	15	35	50
7	PCC LAB`	Estimation, Costing & Contracts Laboratory	-	-	3	1.5	15	35	50
8	PCC LAB	STAAD Pro Laboratory	-	-	3	1.5	15	35	50
9	SOC/SSC	Building Information Modeling (BIM) in Design Construction and Operations Laboratory	-	-	4	2	15	35	50
10	MC	Employability Skills for Civil Engineers	3	-	-	-	-	-	-
11		Industrial/Research Internship of 2 months (to be completed before III year)	-	-	-	-	-	-	-
Total			**18**	**1**	**13**	**21.5**	**210**	**490**	**700**

VISHNU INSTITUTE OF TECHNOLOGY: BHIMAVARAM
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DEPARTMENT OF CIVIL ENGINEERING

Subject	DESIGN & DRAWING OF STEEL STRUCTURES				
Year/semester	III B.Tech/II Sem	L	T	P	C
Regulation year	R - 20	3	1	0	3

Course Objectives:

The objective of this course is to:

1. Familiarize Students with different types of Connections codes and concepts of design of flexural members
2. Understand Design of tension and compression members in trusses
3. Familiarize students with types of Columns, column bases, Plate girder and Gantry Girder their Design.

Course Outcomes:

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

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

SYLLABUS:

UNIT – I

Introduction: Types of structural steel – Mechanical properties of steel – Concepts of plasticity – yield strength - Loads and Stresses – Local buckling behaviour of steel. Concepts of limit State Design – Different Limit States – Load combinations for different Limit states - Design Strengths- deflection limits – serviceability – stability check.

Connections: Design of Connections– Different types of connections – Bolted connections – Design strength – efficiency of joint - Beam to beam and Beam to column connection.

Welded connections: Advantages and disadvantages - Strength of welds-Butt and fillet welds: Permissible stresses – IS Code requirements. Design of fillet weld subjected to in-plane moment acting in the plane and at right angles to the plane of the joints.

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

UNIT – II

Plastic Analysis: Plastic moment – Plastic section modulus - Plastic analysis of continuous beams

Beams: Allowable stresses, design requirements as per IS Code-Design of simple and compound beams-Curtailment of flange plates, check for deflection, shear, buckling, check for bearing, laterally unsupported beams.

UNIT –III

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

UNIT – IV

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

UNIT – V

Design of Plate Girder: Design consideration – 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. The students should prepare the following plates.
Plate 1: Detailing of simple beams,
Plate 2: Detailing of Compound beams including curtailment of flange plates.
Plate 3: Detailing of Column including lacing and battens,
Plate 4: Detailing of Column bases – slab base and gusseted base,
Plate 5: Detailing of steel roof trusses including joint details and
Plate 6: Detailing of Plate girder including curtailment, splicing and stiffeners.

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

Text Books:

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

References:

1. Structural Design in Steel, SarwarAlamRaz, New Age International Publishers, New Delhi
2. Structural Design and Drawing by N.Krishna Raju, Universities Press.
3. Design of Steel Structures by K.S.Sai Ram, Person India Education Services
4. Limit State Design Steel Structures by V.L Shah and Veena Gore, Structures Publications

IS Codes:

1. Indian Standard: 800 - 2007, Indian Standard Code for General Construction in Steel, 3rd revision, Indian Standards Institution, New Delhi, 2008.
2. Indian Standard – 875, Code of practice for design loads (other than earth quake) for buildings and structures (Part-1-Part 5), Bureau of Indian standards.
3. Steel Tables: SP: 6-1(1964) Handbook for Structural Engineers.

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DEPARTMENT OF CIVIL ENGINEERING

Subject	WATER RESOURCES ENGINEERING				
Year/semester	III B.Tech/II Sem	L	T	P	C
Regulation year	R - 20	3	0	0	3

Course Objectives:

1. This course provides the description of hydrological cycle and derive various formulas used in estimation of different basic components of surface and Ground water cycle and its components.
2. Further it will explain the water requirement for irrigation and connectivity of hydrology to the field requirement.
3. To explain the Importance of Irrigation and methods of Irrigation and To understand dams, spillways, diversion head works and cross drainage works.

Course Outcomes:

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

1. Understand the different concepts and terms used in engineering hydrology.
2. To identify and explain various formulae used in estimation of surface hydrology components.
3. Identify and explain various methods to estimate amount of rainfall.
4. To identify and explain various formulae used in estimation of Ground water hydrology components.
5. Demonstrate their knowledge to connect hydrology to the field requirement

SYLLABUS:

UNIT – I

Introduction: Concepts of Hydrologic cycle, Global Water Budget, Applications in Engineering. Sources of data.

Precipitation: Forms of precipitation, characteristics of precipitation in India, measurement of precipitation: Recording and non-recording types, rain gauge network: mean precipitation over an area: Arithmetic, Theissen's and Isohyetal methods, Missing Rainfall Data – Estimation, Consistency of Rainfall records, depth area-duration relationships, maximum intensity/depth duration-frequency relationship, Probable Maximum Precipitation (PMP), rainfall data in India.

UNIT – II

Abstractions from precipitation: Evaporation process, evaporimeters, analytical methods of evaporation estimation, reservoir evaporation and methods for its reduction, evapotranspiration, measurement of evapotranspiration, evapotranspiration equations: Penman and Blaney&Criddle

Methods, potential evapotranspiration over India, actual evapotranspiration, , interception, depression storage, infiltration, infiltration capacity, measurement of infiltration, modelling infiltration capacity, classification of infiltration capacities, infiltration indices.

Runoff: Components of Runoff, Factors affecting runoff, Basin yield, SCS-CN method of estimating runoff, Flow duration curves, Mass curve of runoff – Analysis.

UNIT – III

Hydrographs: Hydrograph –Distribution of Runoff – Hydrograph Analysis Flood Hydrograph – Effective Rainfall – Base Flow- Base Flow Separation – Direct Runoff Hydrograph Unit pulse and Unit step function – Unit Hydrograph, definition, limitations and applications of Unit hydrograph, derivation of Unit Hydrograph from Direct Runoff Hydrograph and vice versa – S-hydrograph, Synthetic Unit Hydrograph.

UNIT – IV

Groundwater Hydrology: Occurrence, movement and distribution of groundwater, aquifers – types, Specific Yield, Permeability, Storage coefficient, Transmissibility, Darcy's Law. Well Hydraulics – Steady radial flow into well for confined and unconfined aquifers, Recuperation tests. Well constants.

Crop Water Requirements: Water requirement of crops-Crops and crop seasons in India, cropping pattern, duty and delta; Quality of irrigation water; Soil-water relationships, root zone soil water, infiltration, consumptive use, irrigation requirement, frequency of irrigation; Methods of applying water to the fields: surface, sub-surface, sprinkler and trickle / drip irrigation.

UNIT – V

Canal Systems: Canal systems, alignment of canals, canal losses, estimation of design discharge. Design of channels- rigid boundary channels, alluvial channels, Regime channels, Kennedy's and Lacey's theory of regime channels. Canal outlets: non-modular, semi-modular and modular outlets. Water logging: causes, effects and remedial measures. Lining of canals Types of lining-Advantages and disadvantages. Drainage of irrigated lands- necessity, methods.

Text Books:

1. Hydrology by K. Subramanya (Tata McGraw-Hill)
2. Irrigation Engineering and Hydraulic structures by Santhosh kumar Garg Khanna publishers
3. G L Asawa, Irrigation Engineering, Wiley Eastern

References:

1. Elements of Engineering Hydrology by V.P. Singh (Tata McGraw-Hill)
2. Engineering Hydrology by Jaya Rami Reddy (Laxmi Publications)
3. Ground water Hydrology by David Keith Todd, John Wiley & Son, New York.
4. Elements of Water Resources Engineering by K.N.Duggal and J.P.Soni (New Age International.

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Subject	GEOTECHNICAL ENGINEERING-II				
Year/semester	III B.Tech/II Sem	L	T	P	C
Regulation year	R - 20	3	0	0	3

Course Objectives:

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

Course Outcomes:

1. Understand the principles and methods of Geotechnical Exploration decide the suitability of soils and check the stability of slopes
2. Calculate lateral earth pressures and check the stability of retaining walls
3. The student must be able to understand the various types of shallow foundations and decide on their location based on soil characteristics.
4. The student must be able to design Piles based on the principles of bearing capacity.
5. The student must be able to compute the magnitude of foundation settlement to decide the size of the foundation.

SYLLABUS:

UNIT - I

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

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 – Taylor's Stability Number-Stability of slopes of dams and embankments – different conditions.

UNIT - II

Earth Retaining Structures: Plastic equilibrium in soils, Earth pressure at rest, Active and Passive earth pressures, Rankine's & Coulomb's theory of earth pressure – Culmann's graphical method – earth pressures in layered soils, Design of gravity retaining wall.

UNIT - III

Shallow Foundations: Introduction - The Ultimate Bearing Capacity of Soil, Types of Failure in Soil, Terzaghi's of Bearing Capacity Theory, Skempton's Bearing Capacity Factor, Effect of

Water Table on Bearing Capacity , The General Bearing Capacity Equation, Ultimate Bearing Capacity of Footings Based on SPT Values (N) , The CPT Method of Determining Ultimate Bearing Capaciy. Plate Load Test, Types of foundation settlements and their determination – allowable settlements of structures. Effect of Size of Footings on Settlement.

Bearing Capacity Criteria: Types of foundations and factors to be considered in their location – Bearing capacity – criteria for determination of bearing capacity – factors influencing bearing capacity – analytical methods to determine bearing capacity – Terzaghi's theory – IS Methods. Settlement Criteria: Safe bearing pressure based on N- value – allowable bearing pressure; safe bearing capacity and settlement from plate load test.

UNIT - IV

Pile Foundations: Types of piles , Uses of piles, Selection of Pile – Load carrying capacity of piles based on static pile formulae – Dynamic pile formulae– Pile load tests –Pile Group Efficiency, Vertical Bearing Capacity of Pile Groups Embedded in Sands and Gravels , Settlement of Piles and Pile Groups in Sands and Gravels, Settlement of Pile Groups in Cohesive Soils, Allowable Loads on Groups of Piles, Negative skin Friction, Uplift Capacity of a Pile Load carrying capacity of pile groups in sands and clays.

UNIT - V

Well Foundations: Types –shapes of wells, Components of well functions –Depth of well foundation, forces acting on well foundations – Design Criteria – Determination of steining thickness and plug – construction and sinking of wells – Tilt and shift.

Text Books:

1. Principles of Foundation Engineering, Das, B.M., (2011), 6th edition Cengage learning
2. Basic and Applied Soil Mechanics, Gopal Ranjan& A.S.R. Rao, New Age International Pvt. Ltd, (2004).

References:

1. Foundation Analysis and Design, Bowles, J.E., (1988), 4th Edition, McGraw-Hill Publishing Company, Newyork.
2. Analysis and Design of Substructures by Swami Saran, SaritaPrakashan, Meerut.

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DEPARTMENT OF CIVIL ENGINEERING

Subject	PEC-II: (a) ARCHITECTURE & TOWN PLANNING				
Year/semester	III B.Tech/II Sem	L	T	P	C
Regulation year	R - 20	3	0	0	3

Course Objectives:

The objectives of this course are:

1. Initiating the students to different architectures of the world. The distinctions between the eastern and western architecture styles are focused.
2. The salient features of Egyptian, Greek, Roman, Indian Vedic, Indus valley civilization, Buddhist, Hindu and Indo-Sarsanic Architecture are introduced.
3. Architectural design concepts, principles of planning and composition are imparted.

Course Outcomes:

Upon the successful completion of this course:

1. The student should be able to distinguish architectural styles of eastern and western world.
2. The student should understand the importance of Orders of architecture.
3. Should understand the historical town planning of the towns and the cities.
4. Should be able to compose spaces of buildings using design concepts, planning principles.
5. Should understand the landscaping features and regulations controlling expansion of the towns and the cities.

SYLLABUS:

UNIT – I

History of Architecture: Western Architecture: Egyptian, Greek, Roman Architectures- Orders. Indian Architecture: Vedic age, Indus valley civilization.

Temples of religions: Buddhist period: Stambas, Stupas, Toranas, Chaityas, Viharas – Hindu temples: Dravidian and Indo Aryan Styles-Temple of Aihole, Madurai, Bhuvaneshwar, Mount Abu. Indo Sarsanic (Islamic) Architecture: Mosque - Palace - Fort - Tomb.

UNIT - II

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

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

UNIT – III

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

UNIT – IV

Modern Town Planning: Zoning- Roads and road traffic- Housing- Slums, Parks, Play grounds- Public Utility Services- Surveys and maps for planning- Neighbourhood Planning.

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

UNIT - V

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

Text Books:

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

References:

1. 'Drafting and Design for Architecture' by Hepler, Cengage Learning
2. 'Architect's Portable Handbook' by John Patten Guthrie –McGraw.Hill International Publications.
3. 'Mordern Ideal Homes for India' by R. S. Deshpande.
4. 'Town and County Planning' by A.J.Brown and H.M.Sherrard.
5. 'Town Design' by FederikGlbbard, Architectural press, London.

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Subject	PEC-II: (b) ROAD SAFETY ENGINEERING				
Year/semester	III B.Tech/II Sem	L	T	P	C
Regulation year	R - 20	3	0	0	3

Course Objectives:

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

Course Outcomes:

The student is able to

1. To understand fundamental of Traffic Engineering.
2. To investigate & determine the collective factors & remedies of accident involved.
3. To design & planning various road geometrics.
4. To massage the traffic system from road safety point of view.
5. To examine the engineering factors for safety.

SYLLABUS:

UNIT – I

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

UNIT – II

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

UNIT – III

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

UNIT – IV

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

UNIT – V

Traffic Management: Systems for Safety, Road Safety Audits and Tools for Safety Management Systems, Road Safety Audit Process, Approach to Safety, Road Safety Improvement Strategies, ITS and Safety.

Text Books:

1. Traffic Engineering and Transportation Planning – L.R. Kadiyali, Khanna Publishers
2. Fundamentals of Transportation Engineering – C.S. Papacostas, Prentice Hall India.
3. Transportation Engineering – An Introduction, C.Jotinkhisty, B. Kent Lall.

References:

1. Fundamentals of Traffic Engineering, Richardo G Sigua
2. Handbook of Road Safety measures, second Edition, Rune Elvik, Alena Hoye, TrulsVaa, Michael Sorenson
3. Road Safety by NCHRP.

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DEPARTMENT OF CIVIL ENGINEERING

Subject	PEC-II: (c) ADVANCED STRUCTURAL ANALYSIS				
Year/semester	III B.Tech/II Sem	L	T	P	C
Regulation year	R - 20	3	0	0	3

Course Objectives:

1. To acquire theoretical and working knowledge about frames, beams, matrices and multi-Storey frames.
2. To acquire theoretical and working knowledge about beams and matrices.
3. To acquiring theoretical and working knowledge about multi-Storey frames

Course Outcomes:

Students will be able to:

1. Analyse different indeterminate structures using Matrix methods.
2. Analyze the multistory building frames by various approximate methods.
3. Solve the continuous beams, portal frames by flexibility methods of analysis.
4. Solve the continuous beams, portal frames by stiffness methods of analysis.
5. Analyze and design of large frames with or without shear walls.

SYLLABUS:

UNIT – I

Introduction to matrix methods of analysis: static indeterminacy and kinematic indeterminacy – degree of freedom – coordinate system – structure idealization stiffness and flexibility matrices – suitability element stiffness equations – elements flexibility equations – mixed force – displacement equations – for truss element, beam element and tensional element. Transformation of coordinates – element stiffness matrix – and load vector – local and global coordinates.

UNIT – II

Assembly of stiffness matrix: From element stiffness matrix – direct stiffness method – general procedure – band matrix – semi bandwidth – computer algorithm for assembly by direct stiffness matrix method.

UNIT – III

Analysis of plane by truss flexibility methods: Continuous beam – plane frame and grids by flexibility methods.

UNIT – IV

Analysis of plane by truss stiffness methods: Continuous beam – plane frame and grids by stiffness methods.

UNIT – V

Introduction to Finite Element Method: General description of the finite element method. Engineering applications of finite element method. Boundary conditions: homogeneous and nonhomogeneous for structural, heat transfer and fluid flow problems.Potential energy method, Rayleigh Ritz method, Galerkin's method, Displacement method of finite element formulation. Convergence criteria, Discretization process, Types of elements: 1D, 2D and 3D, Node numbering, Location of nodes. Strain displacement relations, Stress strain relations, Plain stress and Plain strain conditions, temperature effects.

Text Books:

1. Matrix Analysis of Frames structures by William Weaver J.R and James M. Gere, CBS publications.
2. Advanced Structural Analysis by Ashok. K. Jain, Nem Chand Brothers.
3. A first course in the Finite Element Method Logan, D. L Cengage Learning 6th Edition 2016.

References:

1. Basic Structural Analysis by C.S. Reddy, Tata Mc-Graw hill
2. Matrix Structural Analysis by Madhu B. Kanchi, John Willey publishers
3. Indeterminate Structural Analysis by K.U. Muthuet al., I.K. International Publishing House Pvt. Ltd.
4. Matrix Methods of Structural Analysis by J.L. Meek, Mc-Graw hill.
5. Concepts and Application of Finite Elements Analysis Cook R. D., et al. Wiley & Sons 4th Edition 2003.

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Subject	PEC-II: (d) PRECAST AND PREFABRICATED STRUCTURES				
Year/semester	III B.Tech/II Sem	L	T	P	C
Regulation year	R - 20	3	0	0	3

Course Objective:

1. To impart knowledge to students on modular construction.
2. To impart knowledge to students on industrialised construction.
3. To impart knowledge to students on design of prefabricated elements and construction methods.

Course Outcomes:

1. The student will have good knowledge about design principles, layout of factory and stages of loading in precast construction.
2. Acquire knowledge about panel systems, slabs, connections used in precast construction and they will be in a position to design the elements.
3. Acquire knowledge about types of floor systems, stairs and roofs used in precast construction.
4. Acquire knowledge about types of walls used in precast construction, sealants, design of joints.
5. Acquire knowledge about components in industrial building.

SYLLABUS:

UNIT - I

Introduction: Need for prefabrication – Principles of prefabrication – Modular coordination – Standarization – Materials – Systems – Production – Transportation – Erection.

UNIT - II

Prefabricated Components: Behaviour and types of structural components – Large panel systems – roof and floor slabs – Walls panels - Beams - Columns - Shear walls.

UNIT - III

Design Principles: Design philosophy- Design of cross section based on efficiency of material used – Problems in design because of joint flexibility – Allowance for joint deformation - Demountable precast concrete systems.

UNIT - IV

Joints and Connections in Structural Members: Types of Joints – based on action of forces - compression joints - shear joints - tension joints - based on function - construction, contraction,

expansion. Design of expansion joints - Dimensions and detailing - Types of sealants - Types of structural connections - Beam to Column - Column to Column - Beam to Beam - Column to foundation.

UNIT - V

Design for Abnormal Loads: Progressive collapse – Codal provisions – Equivalent design loads for considering abnormal effects such as earthquakes, cyclones, etc., - Importance of avoidance of progressive collapse.

Text Books:

1. Bruggeling A.S. G and Huyghe G.F. "Prefabrication with Concrete", A.A. Balkema Publishers,USA,1991.
2. Lewitt,M. " Precast Concrete- Materials, Manufacture, Properties And Usage", Applied Science Publishers, London And New Jersey, 1982.
3. Bachmann, H. and Steinle, A. "Precast Concrete Structures", Ernst &Sohn, Berlin, 2011.

References:

1. Koncz T., "Manual of precast concrete construction", Vol. I, II and III, Bauverlag, GMBH, 1976.
2. "Handbook on Precast Concrete Buildings", Indian Concrete Institute, 2016.
3. "Structural design manual", Precast concrete connection details, Society for the studies in the use of precast concrete, Netherland BetorVerlag, 2009.

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DEPARTMENT OF CIVIL ENGINEERING

Subject	OEC/JOE-II: (a) BASICS OF ENVIRONMENTAL ENGINEERING				
Year/semester	III B.Tech/II Sem	L	T	P	C
Regulation year	R - 20	3	0	0	3

Course Objectives:

1. To understand the basic of water borne diseases, drinking water standards and treatment of wastewater and disposal.
2. To expose the students to understand to treatment of wastewater and disposal.
3. To learn the basics of air pollution and effects, noise pollution and solid waste disposal

Course Outcomes:

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

1. Demonstrate water sources, water borne diseases, water treatment and potable water standards
2. Understand basics of wastewater treatment and disposal methods
3. Identity air pollution sources and understand air pollution effects
4. Identity noise pollution sources and understand noise pollution effects
5. Understand sources and basic principles of solid waste

SYLLABUS:

UNIT - I

Water: Introduction; Sources of water; Availability of fresh water; Water borne diseases; Brief explanation on ground and surface water treatment; Potable water standards as per IS and WHO standards; Water conservation; Role of public health engineering department in the prevention of the water borne diseases.

UNIT - II

Wastewater: Wastewater sources; Sewage characteristics; Brief explanation on treatment of sewage; Disposal of treated wastewater; Practise on reuse of treated wastewater; Effects of wastewater without treatment disposal in streams, on land.

UNIT - III

Air pollution sources and effects: Layers of atmosphere; Sources and classification of air pollutants – Man made, Natural sources; Type of air pollutants; Pollution due to automobiles; Effect of air pollution on health, vegetation and materials; Global warming; Worst environmental disasters caused by humans.

UNIT - IV

Noise Pollution: Sources of noise pollution - plane, point and line sources, multiple sources; Effect of noise pollution on humans; Control of noise pollution; Outdoor and indoor noise propagation; Intensity of noise pollution; Noise pollution permissible limits as per CPCB and WHO.

UNIT - V

Solid Waste: Sources of solid waste – classification solid waste - Basic principles of Solid Waste storage, collection, transportation, processing and Disposal.

Text Books:

1. S.K. Garg (2019), Water supply Engineering – Environmental Engineering (Vol.I) – Khanna Publishers.
2. S.K. Garg (2019), Sewage Disposal and Air Pollution Engineering – Environmental Engineering (Vol. II) – Khanna Publishers.
3. Punmia B.C., Ashok Jain & Arun Jain (2014) Water Supply Engineering, Laxmi Publication Pvt., Ltd., New Delhi
4. Punmia B.C., Ashok Jain & Arun Jain (2014) Wastewater Engineering, Laxmi Publication Pvt., Ltd., New Delhi

References Books

1. Peavy, H.S, Rowe, D.R., and G. Tchobanoglous (2017), Environmental Engineering, McGraw Hill Inc., New York.

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Subject	OEC/JOE-II: (b) INNOVATIVE CONSTRUCTION MATERIALS				
Year/semester	III B.Tech/II Sem	L	T	P	C
Regulation year	R - 20	3	0	0	3

Course Objectives:

1. To understand the applications and properties of various building materials.
2. To know the various types of metals, Polymers, Bitumen in construction and to know the properties, usage of gypsum, adhesives, water proofing materials in construction industry.
3. To understand the potential applications of architectural materials and to obtain the knowledge about smart materials.

Course Outcomes:

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

1. Identify different types of modern materials, Paints, Enamels and Varnishes that are used in construction.
2. Explain the role of metals, Polymers, Bitumen in construction industry.
3. Identify the required architectural materials for various buildings.
4. Outline various smart materials suitable for structures.
5. Explain the usage of materials like gypsum, adhesives, water proofing materials in construction industry.

SYLLABUS:

UNIT - I

Modern Building Materials: Ceramics, Sealants for joints, fibre glass reinforced plastic, refractories- composite materials, Geosynthetics, Concrete Canvas, Geotextile and its types. Paints, Enamels And Varnishes: Introduction, rubber paints, plastic emulsion paints, plastic paints, enamel paints, texture paints, varnish, wax polish.

UNIT - II

Metals, Plastics, Bitumen: Metals and Special Alloys of Steel - Water Jet Cut Stainless Steel, Mill Slab Steel, Tension Rods Assemblies and Cast Iron - Heat Treatment – Tendons - GI sheets, tubes and lightweight roofing materials - Aluminum and its products. Plastics, Bitumen: Composition, polymerization, Classification of plastics, biodegradable plastic, Grades of Bitumen, Unplasticized Polyvinyl Chloride (UPVC) and its materials.

UNIT - III

Architectural Materials:

Glass: Composition, classification, properties and types of glass, architectural glass. Wood and Wood Product, Floor Finishes, laminates.

Sound Absorbent Materials: Porous materials, porous-cum-elastic materials, perforated materials, Baffle materials – ceiling and walls panels.

UNIT - IV

Smart Materials: Neoprene, Bridge pads, thermocol, Smart and Intelligent Materials – Special features –Case studies showing the applications of smart and Intelligent Materials. Case studies showing the applications of smart and Intelligent Materials.

UNIT - V

Gypsum: Introduction, plaster of Paris, gypsum wall plasters, gypsum plaster boards, Non-load bearing Gypsum partition blocks.

Miscellaneous materials: Adhesives- advantages and disadvantages, properties, types of Adhesives; Different types of Building faced cladding materials; heat insulating materials; water proofing materials.

Text books:

1. Engineering Materials by S. C. Rangwala; Charotar Publishing House, 33 Edn 2017.
2. Building materials by S.K Duggal; New Age International publishers, 3rd Edn, 2009.

Reference books:

1. Building materials by P.C Varghese; PHI Learning, 2nd Edn 2005.
2. Kumar MehtaP. and Paulo J. M. Monteiro, (2014), Concrete: Microstructure, Properties and Materials, 4th Edition, McGraw-Hill, New Delhi.
3. George C. Sih, Alberto Carpinteri and Surace, G (Eds.) (2010), Advanced Technology for Design and Fabrication of Composite Materials and Structures: Applications to the Automotive, Marine, Aerospace and Construction Industry, in: Engineering Applications of Fracture Mechanics Series, Springer, Netherlands.
4. ACI 211.1-91 Reapproved 2009, Standard Practice for selecting Proportions for Normal, Heavyweight, and Mass Concrete, USA

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Subject	SURVEYING FIELD WORK- II (LABORATORY)				
Year/semester	III B.Tech/II Sem	L	T	P	C
Regulation year	2022-2023	0	0	3	1.5

Course Objectives:

1. To impart the practical knowledge in the field- measuring distances, directions, angles.
2. To determining R.L.'s areas and volumes.
3. To set out Curves and to draw Plans and Maps.

Course Outcomes:

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

1. Apply the principle of surveying for Civil Engineering Applications.
2. Calculation of areas, elevations, distance, Drawing plans and contour maps using different measuring equipment like Theodolite, Total Station at field level and write a technical laboratory report.

List of Experiments:

1. Theodolite Survey: Determining the Horizontal and Vertical Angles by the method of repetition method.
2. Theodolite Survey: Finding the distance between two inaccessible points.
3. Theodolite Survey: Finding the height of far object.
4. 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 & Contouring
10. Total Station: Determination of Remote height & distance between two inaccessible points.

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DEPARTMENT OF CIVIL ENGINEERING

Subject	ESTIMATION, COSTING & CONTRACTS LABORATORY				
Year/semester	III B.Tech/II Sem	L	T	P	C
Regulation year	R - 20	0	0	3	1.5

Course Objectives:

The objective of this course is to enable the students to:

1. Understand the quantity calculations of different components of the buildings.
2. Understand the rate analysis of different quantities of the buildings components.
3. Learn various specifications and components of the buildings.

Course Outcomes:

Upon the successful completion of this course:

1. Understand the technical specifications for various works to be performed for a project and how they impact the cost of a structure.
2. Quantify the worth of a structure by evaluating quantities of constituents, derive their cost rates and build up the overall cost of the structure.
3. Understand how competitive bidding works and how to submit a competitive bid proposal.
4. An idea of how to optimize construction projects based on costs.
5. An idea how construction projects are administered with respect to contract structures and issues.

List of Experiment:

1. Estimation of building(long wall method)
2. Estimation of building(center line method)
3. Analysis of rate for concrete work
4. Analysis of rate for brick work
5. Analysis of rate for plaster work
6. Estimate quantity of reinforcement
7. Preparation for approximate estimate for road project
8. Estimating cost of building on plinth area method
9. Estimation of building (short wall method)
10. Estimation of Steel Roof Trusses

Text Books:

1. Estimating and Costing, B.N. Dutta, UBS publishers, 2000.
2. Civil Engineering Contracts and Estimates, B. S. Patil, Universities Press (India) Pvt. Ltd., Hyd.

3. Construction Planning and Technology, Rajiv Gupta, CBS Publishers & Distributors Pvt. Ltd. New Delhi.
4. Estimating and Costing, G.S. Birdie.

References:

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

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DEPARTMENT OF CIVIL ENGINEERING

Subject	STAAD PRO LABORATORY				
Year/semester	III B.Tech/II Sem	L	T	P	C
Regulation year	R - 20	0	0	3	1.5

Course Objectives:

The objective of this course is to enable the students to:

1. Understand the Structural Analysis Software's
2. Understand the Various tools and commands used in the Software.
3. Learn various beam design and analysis of beams, trusses, frames and Retaining walls

Course Outcomes:

Upon the successful completion of this course:

1. The student should be able to get awareness on Structural Analysis Software.
2. The student should be in a position to design any structural Components.
3. The student should be in a position to analyse any structural Components.
4. The student should be capable of designing any Civil engineering simple Structures like beams, frames and trusses.
5. The student should be capable of designing any Civil engineering Structures like Towers, footings etc.,

EXERCISES:

1. Introduction to Staad Pro
2. Analysis of Continuous beam
3. Analysis of Single storey frame
4. Analysis of Multi-storey frame
5. Design of Multi-storey frame
6. Analysis of Multi-storeyed building
7. Design of Multi-storeyed building
8. Wind load analysis on RCC building
9. Analysis and design of Steel truss
10. Analysis and design of Isolated footing

SOFTWARE:

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

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DEPARTMENT OF CIVIL ENGINEERING

Subject	BUILDING INFORMATION MODELLING (BIM) IN DESIGN CONSTRUCTION AND OPERATIONS LABORATORY				
Year/semester	III B.Tech/II Sem	L	T	P	C
Regulation year	R - 20	0	0	4	2

Course Objectives:

The objective of this course is to enable the students to:

1. Understand the Building Information Modelling Software.
2. Understand the Various tools and commands used in REVIT.
3. Learn various drawing components like doors, windows, Curtain walls etc.

Course Outcomes:

Upon the successful completion of this course:

1. The student should be able to get awareness on BIM Software.
2. The student can able to learn various drawing and editing tools.
3. The student should be capable of Modelling Interiors of any Buildings.
4. The student should be capable to design elevation of the structure.
5. The student should be in a position to create building components using REVIT.

EXERCISES:

1. Introduction to BIM & AUTODESK REVIT
2. Basic drawing and editing tools
3. Setting up Levels and Grids
4. Modelling Walls
5. Working with Doors and Windows
6. Working with Curtain Walls
7. Working with Views
8. Adding Components
9. Modelling Floors
10. Modelling Ceilings & Roofs, Modelling Stairs and Railing

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DEPARTMENT OF CIVIL ENGINEERING

Subject	EMPLOYABILITY SKILLS FOR CIVIL ENGINEERS				
Year/semester	III B.Tech/II Sem	L	T	P	C
Regulation year	R - 20	3	0	0	0

Course Objectives:

Enable the students to

1. Understand divisibility, concepts of LCM &HCF; understand divisibility concepts of CM& HCF, profit or loss incurred in a transaction.
2. Understand concepts of SI & CI and difference between them and understand the logic in series, concepts of clocks, identifying day of date.
3. Know the relation between time, speed &distance and combined work & wages paid forthe work and be familiar with family relations, the techniques of coding.

Course Outcomes:

After completing this course, the students will be able to adopt speed computation techniques and develop logical thinking which are essential for campus recruitment such as

1. Find least and greatest number divisible by given numbers and leaving some remainder(s). Identify the profit or loss incurred in a transaction and how cheating is possible by an unfair trader.
2. Able to calculate the simple and compound interest and the EMI repayment for a loan.
3. Evaluate the time taken by a train/car for crossing a static or a moving object and time taken by a person to a row a boat in a river, calculate the time required for individual or combined work, shares of amount for their work and time taken for a tank/cistern to get filled by inlets and outlet.
4. Identify the relation between given persons, Decode the given code patter and code given word in terms of alphabet, numbers, symbols and mixed.
5. Identify missing term in the pattern/series, find angle between hands at given time and vice-versa, find day of given date and vice-versa.

SYLLABUS:

UNIT - I

Number Systems -Profit& Loss: Basic number systems, Divisibility Rules LCM and HCF Cost Price- Selling Price- Marked Price, Discount- Successive Discounts, Profit or Loss Percentage, False Weights- Dishonest Dealer.

UNIT – II

Simple & Compound Interest: Principal-Interest Rate-Tenure, Simple Interest-Formula-Sum, Compound Interest-Formula-Relation between Simple & Compound Interest, loan-EMI, Investments-Shares.

UNIT - III

Time & Distance- Time & Work: Time-Distance-Speed-Relation, Conversion of Speed, Average Speed. Trains-Relative Speed-Same and Opposite -Platform, Races, Boats-Streams-Upstream and Downstream**.** Work- Time- Efficiency Combined Work – Partnership - Division of Wages, Chain Rule, Pipes and Cisterns - Inlet - Outlet.

UNIT – IV

Blood Relations, Coding & Decoding: Blood relations -family tree, first person narrating type coded relation-puzzle relation**.** Coding and decoding-letter coding, number coding, symbol coding, substitution and mixed type.

UNIT – V

Series, Clocks & Calendars: Series number, letter and word type, missing term, odd-man out Angle between hands - correct or incorrect time, day of a date repeated calendars.

Text Books:

1. Dr. RS Aggarwal. Quantitative Aptitude for competitive Examinations Sultan Chand Publications 2017.
2. Dr. R.S Aggarwal Modem Approach to Verbal & Non-Verbal Reasoning Sultan Chand Publications, 2018.

References:

1. Arum Sharma, How to Prepare for Quantitative Aptitude for the CAT, Tata McGraw Hill Publishing Company, 2016.
2. Dinesh Khattar, The Pearson Guide to Quantitative Aptitude for Competitive Examinations, Pearson India 2016.
3. BS Siwali and Indu Sijwali, A New Approach to Reasoning Verbal & Non-Verbal Arihant Publishers, 2016.
4. M.K. Pandey. Analytical Reasoning Bsc Publishing Co. Pvt. Ltd 2009

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Course Structure – R20
(With effect from 2020-2021)

IV Year - I Semester

S.No.	Category	Course Title	L	T	P	C	IM	EM	TM
1	PEC-III	Pre-stressed Concrete Advanced Structural Engineering Urban Transportation and Planning Bridge Engineering	3	-	-	3	30	70	100
2	PEC-IV	Ground Improvement Techniques Geo-Spatial Technologies Reinforced Soil Structures Industrial waste water treatment	3	-	-	3	30	70	100
3	PEC-V	Design & Drawing of Irrigation Structures Solid Waste Management Urban Hydrology Earth Retaining Structures	3	1 - -	-	3	30	70	100
4	OEC/JOE-III	Repair & Rehabilitation of Structures Disaster Management & Mitigation	3	-	-	3	30	70	100
5	OEC/JOE- IV	Smart City Planning and Development Green Building Technologies	3	-	-	3	30	70	100
6	HSSE	Fundamentals of Entrepreneurship Managerial Economics & Management Science Business Environment	3	-	-	3	30	70	100
7	SOC	Computer Aided Project Management Laboratory	-	-	4	3	15	35	50
8		Industrial/Research Internship 2 months (after third year, to be evaluated after VII semester)	-	-	-	2	50	-	50
Total			**18**	**1**	**4**	**23**	**245**	**455**	**700**

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Subject	PEC-III: (a) PRE-STRESSED CONCRETE				
Year/semester	IV B.Tech / I Sem	L	T	P	C
Regulation year	R - 20	3	0	0	3

Course Objectives:

The objective of this course is:

1. Familiarize Students with concepts of prestressing
2. Equip student with different prestressing systems and devices
3. Understand losses of prestress including short- and long-term losses and to familiarize students with analysis and design of prestressed concrete members under flexure, shear and torsion.

Course Outcomes:

1. At the end of this course the student will be able to understand different methods of prestressing.
2. Estimate effective prestress including short- and long-term losses.
3. Analyze and design prestressed concrete beams under flexure.
4. Analyze and design prestressed concrete beams under shear.
5. Understand the relevant IS Code provisions for prestressed concrete

SYLLABUS:

UNIT - I

Introduction & Methods and Systems of pre-stressing: 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. **Introduction to Transmission length and End block (no Design and Analytical problems).**

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 long-term deflections.

Text Books:

1. N.Krishna Raju, “Prestressed Concrete”, 6e Tata Mc Graw Hill Book co.
2. K.U.Muthu, “Prestressed Concrete”, by PHI Learning Pvt. Ltd.
3. T.Y. Lin and Burn, “Design of prestress concrete structures”, John Wiley, New York.

References:

1. N. Rajagopalan, “Prestressed Concrete”, Narosa Publishing House.
2. S. Ramamrutham, “Prestressed concrete”, Dhanpat Rai & Sons, Delhi.
3. Indian Standard 1343:2012 – Pre-stressed Concrete — Code of Practice.
4. Charles W. Dolan and H. R. (Trey) Hamilton, “Prestressed Concrete: Building, Design, and Construction”, Springer; 1st ed. 2019 edition (14 November 2018).

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DEPARTMENT OF CIVIL ENGINEERING

Subject	PEC-III: (b) ADVANCED STRUCTURAL ENGINEERING				
Year/semester	IV B.Tech/I Sem	L	T	P	C
Regulation year	R - 20	3	0	0	3

Course Objectives:
The objective of this course is:

1. Familiarize Students with Raft Foundations and Retaining walls.
2. Equip student with concepts of design of different types of RCC water tanks.
3. Understand Concepts of flat slabs and familiarize different types of Bunkers, Silos and Chimneys.

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

1. Design types of RCC retaining walls.
2. Carryout analysis and design of different types of RCC water tanks.
3. Design of flat slabs.
4. Solve the problems design of RCC Bunkers, Silos.
5. Solve the problems design of Chimneys.

SYLLABUS:

UNIT – I

Design of Retaining walls: Types, failure modes, static pressure, acquisition of soil parameters, Backfilled walls Stability check, Compaction pressure, Lateral pressure due to external loads.

UNIT – II

Design of Over-Head Tanks: Design of over-head tanks: Design of RC domes and beams curved in plan, design of Cylindrical and rectangular tanks with different end conditions using IS: 3370 tables.Intze tank design based on membrane analysis with mention of continuity effects. Design of staging: Braces, Columns and Raft Foundation.Design of Rectangular and circular tanks – Approximate Methods and IS Methods – Design of underground tanks – Design of base slab and side wall – Check for uplift.

UNIT – III

Design of Flat Slabs: Flat slabs and yield line based design, Design of flat slabs and flat plates according to IS method - Check for Punching shear.

UNIT – IV

Design of Bunkers and Silos: Introduction, Differences between bunker and silo, Design of square or rectangular bunkers, Design of circular bunkers, Design of silos, Silos for storage of cement.

UNIT – V

Design of Chimney: Introduction, Wind pressure, Stress in chimney shaft due to self weight and wind, Stress in horizontal reinforcement due to wind shear, Stresses due to temperature difference, Design of RC chimney.

Text Books:

1. B. C. Punmia, Ashok Kumar Jain and Arun Kumar Jain, "Reinforced Concrete Structures", Vol-2, Laxmi, publications Pvt. Ltd., New Delhi.
2. N. Krishna Raju, "Design Drawing of Concrete and Steel Structures", University Press 2005.
3. Ramakrishna. V. Arthur P.D., "Ultimate Strength Design for Structural Concrete", Pitman, London.

References:

1. S. U, Pillai and D. Menon, "Reinforced concrete design", Tata Mc.Grawhill Publishing Company.
2. N. Subrahmanian, "Reinforced Concrete Structures", Oxford Publishers.
3. Wai-Fah Chen, "Plasticity, Limit Analysis, Stability and Structural Design: An Academic Life Journey from Theory to Practice", World Scientific Publishing (February 15, 2021).

Internal Examination Pattern:

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

1. Descriptive (subjective type) examination : 25 Marks
2. Assignment : 05 Marks

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%.

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Subject	PEC-III: (c) URBAN TRANSPORTATION AND PLANNING				
Year/semester	IV B.Tech/I Sem	L	T	P	C
Regulation year	R - 20	3	0	0	3

Course Objectives:
The objective of this course is:

1. To learn various procedures for travel demand estimation.
2. To various data collection techniques for OD data and to develop alternative urban transport network plans.
3. To know various models and techniques for trip generation, trip distribution, mode choice and traffic assignment.

Course Outcomes:
At the end of course, Student can

1. Design, conduct and administer surveys to provide the data required for transportation planning.
2. Supervise the process of data collection about travel behavior and analyze the data for use in transport planning.
3. Develop and calibrate modal split, trip generation rates for specific types of land use developments.
4. Develop and calibrate trip distribution for specific types of land use developments.
5. Adopt the steps that are necessary to complete a long-term transportation plan.

SYLLABUS:

UNIT - I

Urban transport planning: Urbanization, urban class groups, transportation problems and identification, impacts of transportation, urban transport system planning process, modeling techniques in planning. Urban mass transportation systems: urban transit problems, travel demand, types of transit systems, public, private, para-transit transport, mass and rapid transit systems, BRTS and Metro rails, capacity, merits and comparison of systems, coordination, types of coordination.

UNIT - II

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

UNIT - III

Trip Generation & Distribution: UTPS Approach, Trip Generation Analysis: Zonal Models, Category Analysis, Household Models, Trip Attraction models, Commercial Trip Rates; Trip Distribution by Growth Factor Methods. Problems on above.

UNIT - IV

Trip Distribution: Gravity Models, Opportunity Models, Time Function Iteration Models. Travel demand modeling: gravity model, opportunity models, Desire line diagram. Modal split analysis. Problems on above.

UNIT - V

Traffic Assignment: Diversion Curves; Basic Elements of Transport Networks, Coding, Route Properties, Path Building Criteria, Skimming Tree, All-or-Nothing Assignment, Capacity Restraint Techniques, Reallocation of Assigned Volumes, Equilibrium Assignment. Introduction to land use planning models, land use and transportation interaction.

Text Books:

1. Hutchinson, B.G., “Introduction to Urban System Planning”, McGraw Hill.
2. Khisty C.J., “Transportation Engineering - An Introduction”, Prentice Hall.
3. Papacostas, “Fundamentals of Transportation Planning”, Tata McGraw Hill.

References:

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

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Subject	PEC-III: (d) BRIDGE ENGINEERING				
Year/semester	IV B.Tech/I Sem	L	T	P	C
Regulation year	R - 20	3	0	0	3

Course Objectives:
The objective of this course is:

1. Familiarize Students with different types of Bridges and IRC standards.
2. Equip student with concepts and design of Slab Bridges, T Beam Bridges, Box Culverts.
3. Understand concepts of design of Plate Girder Bridges and familiarize with different methods of inspection of bridges and maintenance.

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

1. Explain different types of Bridges with diagrams and Loading standards
2. Carryout analysis and design of Slab bridges and suggest structural detailing.
3. Carryout analysis and design of T Beam bridges.
4. Carryout analysis and design of Plate girder bridges
5. Carryout analysis and design of Box culvers and suggest structural detailing.

SYLLABUS:

UNIT - I

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

UNIT - II

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

UNIT - III

T-Beam Bridges: Analysis and design of various elements of bridge –Design of deck slab, Longitudinal girders, Secondary beams- Reinforcement detailing.

UNIT - IV

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

UNIT - V

Box Culverts: Loading – Analysis and Design- Reinforcement detailing.

Sub Structure: Abutments-Stability analysis of abutments-piers-loads on piers, Analysis of piers-Wing Walls-Design problems.

Text Books:

1. Jhonson Victor D, “Essentials of Bridge Engineering”.
2. T. R. Jagadeesh, M.A. Jayaram, “Design of Bridge Structures”, PHI
3. N. Krishna Raju, “Design of Bridges”, Tata McGraw Hill.

References:

1. Aswini, Vazirani, Ratwani, “Design of concrete bridges”.
2. B. C. Punmai, Jain & Jain, “Design of steel structures”, Lakshmi Publications.
3. B. C. Punmai, Jain & Jain, “Design of R C structures”, Lakshmi Publications.
4. Dr. Wai-Fah Chen & Dr. Lian Duan, “Bridge Engineering Handbook: Fundamentals 2nd Edition”, CRC Press; 2nd edition (24 January 2014).
5. Indian Road Congress: 6-2014 Standard specifications and code of practice for road bridges.
6. Indian Road Congress: 7-2017 Recommended practice for numbering culverts, bridges and tunnels.
7. Indian Road Congress: 5-2015 Standard specifications and code of practice for road bridges.

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DEPARTMENT OF CIVIL ENGINEERING

Subject	PEC-IV: (a) GROUND IMPROVEMENT TECHNIQUES				
Year/semester	IV B.Tech/I Sem	L	T	P	C
Regulation year	R - 20	3	0	0	3

Course Objectives:

The objective of this course is:

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

Course Outcomes:

1. Understand the principles of various ground improvement techniques.
2. Prefer suitable ground improvement techniques based on the Soil conditions and local available Materials.
3. Understand the principles and suitability of various stabilization techniques.
4. Select suitable stabilization techniques based on the Soil conditions and local available materials.
5. Understand the Principles of dewatering techniques and to apply suitable dewatering technique in the field depending on the requirement.

SYLLABUS:

UNIT – I

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

UNIT - II

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

UNIT- III

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

UNIT - IV

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

UNIT - V

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

Text Books:

1. Purushotham Raj, “Ground Improvement Techniques”, Laxmi Publications, New Delhi.
2. Nihar Ranjan Patro, “Ground Improvement Techniques”, Vikas Publishing House (p) limited, New Delhi.
3. RM Koerner, “Designing with Geosynethetics”, Prentice Hall.

References:

1. MP Moseley, “Ground Improvement”, Blackie Academic and Professional, USA.
2. G.L.Siva Kumar Babu, “An introduction to Soil Reinforcement and Geosynthetics”, Universities Press.

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Subject	PEC-IV: (b) GEO- SPATIAL TECHNOLOGIES				
Year/semester	IV B.Tech/I Sem	L	T	P	C
Regulation year	R - 20	3	0	0	3

Course Objectives:

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

Course Outcomes:

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

SYLLABUS:

UNIT – I

Introduction: Basic concepts, socioeconomic challenges, fundamentals of geographical information systems (GIS), history of geographical information system, components of geographical information systems.

Projections and Coordinate Systems: Map definitions, representations of point, line, polygon, common coordinate system, geographic coordinate system, map projections, transformations, map analysis.

UNIT – II

Data Acquisition: Data Types, Spatial, Non-Spatial (Attribute) Data, Data Format – Vector and Raster Data, Manual Digitizing, Scanner, Aerial Photographic Data, Remotely Sensed Data, Digital Data, Cartographic Database, Digital Elevation Data.

Data Management: Data Storage and Maintenance, Data Compression, Data Quality and Standards, Precision, Accuracy, Error – Geometric errors and corrections, Radiometric errors and corrections, types of Systematic and Non-systematic errors.

UNIT – III

Data Modelling: Spatial Data Analysis, Data Retrieval Query, Simple Analysis, Recode Overlay, Vector Data Model, Raster Data Model, Digital Elevation Model, Cost and Path Analysis, Knowledge Based System.

GIS Analysis and Functions: Organizing data for analysis, analysis function, maintenance and analysis of spatial data, buffer analysis, overlay analysis, transformations, conflation, edge matching and editing, maintenance and analysis of spatial and non-spatial data.

UNIT – IV

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

UNIT – V

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

Text Books:

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

References:

1. Sabins F.F. Jr. (1978), “Remote Sensing Principles and Interpretations”, W.H. Freeman and Company, San Francisco.
2. Tor Bernhardsen. (2002), “Geographical Information System”, Wiley India (P) Ltd., Third Edition, New Delhi.
3. Hoffman-Wellenhof, B, et al. (1997), “GPS Theory and Practice”, Fourth Edition, Springer Wein, New York.

4. Lilysand T.M., and Kiefer R.W. (2002),"Remote Sensing and Image Interpretation", John Wiley and Sons, Fourth Edition, New York.
5. Choudhury S., Chakrabarti, D., and Choudhury S. (2009), "An Introduction to Geographic Information Technology", I.K. International Publishing House (P) Ltd, New Delhi.

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DEPARTMENT OF CIVIL ENGINEERING

Subject	PEC-IV: (c) REINFORCED SOIL STRUCTURES				
Year/semester	IV B.Tech/I Sem	L	T	P	C
Regulation year	R - 20	3	0	0	3

Course Objectives:

This course will enable students to:

1. Create an understanding of the latest technique such as reinforcing the soil.
2. Analyze the concept of RE so as to ascertain stability of RE structures.
3. Understand the different reinforcing materials that can be used efficiently in soils and to understand design concepts of different RE structures including introductory concepts of Foundations resting of RE soil bed.

Course Outcomes:

After studying this course, students will be able to:

1. Identify, formulate reinforced earth techniques that are suitable for different soilsand in different structures;
2. Understand the laboratory testing concepts of Geosynthetics
3. Design RE retaining structures and Soil Nailing concepts.
4. Determine the load carrying capacity of Foundations resting on RE soil bed.
5. Asses the use of Geosynthetics in drainage requirements and landfill designs

SYLLABUS:

UNIT - I

Basics of Reinforced Earth Construction: Definition, Historical Background, Components, Mechanism and Concept, Advantages and Disadvantage of reinforced earth Construction, Sandwich technique for clayey soil.

Geosynthetics and Their Functions: Historical developments, Recent developments, manufacturing processwoven&non-woven, Raw materials – Classification based on materials type – Metallic and Non-metallic, Natural and Man-made, Geosynthetics.

Properties and Tests on Materials Properties: Physical, Chemical, Mechanical, Hydraulic, Endurance and Degradation requirements, Testing & Evaluation of properties.

UNIT - II

Design of Reinforced Earth Retaining Walls: Concept of Reinforced earth retaining wall, Internal and external stability, Selection of materials, Typical design problems.

Soil Nailing Techniques: Concept, Advantages & limitations of soil nailing techniques, comparison of soil nailing with reinforced soil, methods of soil nailing, Construction sequence, Components of system, Design aspects and precautions to be taken

UNIT - III

Design of Reinforced Earth Foundations: Modes of failure of foundation, Determination of force induced in reinforcement ties – Location of failure surface, tension failure and pull out resistance, length of tie and its curtailment, Bearing capacity improvement in soft soils, General guidelines.

UNIT - IV

Geosynthetics for Roads and Slopes: Roads - Applications to Temporary and Permanent roads, Role of Geosynthetic in enhancing properties of road, control of mud pumping, Enhancing properties of subgrade, Design requirements Slopes – Causes for slope failure, Improvement of slope stability with Geosynthetic, Drainage requirements, Construction technique. Simple Numerical Stability Checking Problems on Reinforced Slopes

UNIT - V

Geosynthetics - Filter, Drain And Landfills: Filter & Drain – Conventional granular filter design criteria, Geosyntheticfilter design requirements, Drain and filter properties, Design criteria – soilretention, Geosynthetic permeability, anticlogging, survivability and durability (No Numerical Problems) Landfills – Typical design of Landfills – Landfill liner & cover, EPA Guidelines, Barrier walls for existing landfills and abandoned dumps (No Numerical Problems)

Text Books:

1. Koerner. R.M, “Design with Geosynthetics”, Prince Hall Publications
2. Koerner. R.M. &Wesh, J.P, “Construction and Geotechnical Engineering using synthetic fabrics”, Wiley Inter Science, NewYork.
3. SivakumarBabu G. L., “An introduction to Soil Reinforcement and Geosynthetics”, Universities Press, Hyderabad.

4. Swami Saran, “Reinforced Soil and its Engineering Applications”, I. K. International Pvt. Ltd, New Delhi.
5. Venkattappa Rao, G., & Suryanarayana Raju., G. V.S, “Engineering with Geosynthetics”, Tata McGraw Hill publishing Company Limited., New Delhi.

Reference Books:

1. Jones, “Earth reinforcement and Soil structure”, CJEP Butterworths, London
2. Ingold, T.S. & Millar, K.S, “Geotextile Hand Book”, Thomas, Telford, London.
3. Hidetoshi Octial, Shigenori Hayshi & Jen Otani, “Earth Reinforcement Practices”, Vol. I, A.A. Balkema, Rotterdam
4. Bell F.G, “Ground Engineer’s reference Book”, Butterworths, London
5. Ingold, T.S, “Reinforced Earth”, Thomas, Telford, London.
6. Sarsby R W- Editor, “Geosynthetics in Civil Engineering”, Wood head Publishing Ltd & CRC Press, 2007

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DEPARTMENT OF CIVIL ENGINEERING

Subject	PEC-IV: (d) INDUSTRIAL WASTEWATER TREATMENT				
Year/semester	IV B.Tech/I Sem	L	T	P	C
Regulation year	R - 20	3	0	0	3

Course Objectives:

1. To study Characteristics and primary treatment methods for industrial wastewater
2. To learn physic-chemical and biological treatment techniques
3. To understand food and material industries waste treatment

Learning Outcomes:

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

1. Identify the characteristics of Industries wastewater
2. Describe the required primary treatment methods for industrial wastewater
3. Illustrate the required advanced treatment methods for industrial wastewater
4. Suggest food industries wastewater treatment techniques
5. Propose material industries wastewater treatment techniques.

SYLLABUS:

UNIT – I

Industrial Wastewater Characteristics: Introduction; Characteristics - Physical, Chemical and Biological; Differences between industrial and municipal wastewater; Difficulty to generalize industrial waste characteristics; Direct, Separate, combined treatment; Effects of industrial effluents on sewers and treatment plants.

UNIT – II

Primary Treatment: Equalization-objectives, parameters that could be treated by equalization; Proportioning; Dilution with other effluents; Neutralization; Mixing wastes – Oil Separation by Floatation**,** quiescent flotation and mechanically aerated floatation, types of solids that can be removed by floatation; Waste reduction – volume reduction, strength reduction, recirculation of industrial waste.

UNIT – III

Advanced Treatment: Nitrification and De-nitrification by biological method; Rotating biological contactor; Phosphorous removal by chemical precipitation; Heavy metal removal by chemical precipitation; Precipitation reactions; Air Stripping; Adsorption; Ion exchange.

UNIT – IV

Food Industries: Manufacturing Processes, sources of waste, characteristics and Composition of waste, and waste treatment method (Chemical or Biological or Chemical and Biological)- Dairy, Sugar, Fermentation, Brewery, Distillery, and Meat.

UNIT – V

Material Industries: Manufacturing Processes, sources of waste, characteristics and Composition of waste, and waste treatment method (Chemical or Biological or Chemical and Biological) – Paper and pulp, Tannery, Textile, Steel, Cement, Mining.

Text Books:

1. M. N. Rao and A.K. Datta, "Waste water Treatment", Oxford & IBH Publishing Co, Private Ltd. 3rd Edition, 2017.
2. S.K. Garg, "Sewage Disposal and Air Pollution Engineering", Environmental Engineering Vol. II, Khanna Publishers.

Reference Books:

1. Eckenfelder W. Jr., "Industrial Water Pollution Control", 3rd ed., New York, Mc Graw Hill, 1999.
2. Peavy, H.S, Rowe, D.R., and G. Tchobanoglous, "Environmental Engineering, McGraw Hill Inc., New York, 2017.

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DEPARTMENT OF CIVIL ENGINEERING

Subject	**PEC-V: (a) DESIGN AND DRAWING OF IRRIGATION STRUCTURES**				
Year/semester	**IV B.Tech/I Sem**	**L**	**T**	**P**	**C**
Regulation year	**R - 20**	**3**	**1**	**0**	**3**

Course Objectives:

1. To understand design principle of Surplus weir and Tank sluice with a tower head.
2. To understand design principle of Canal drop-Notch type and Canal regulator.
3. To understand design principle of Under tunnel and Syphon aqueduct type III.

Course Outcomes:

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

1. Design principle of Surplus weir.
2. Design principle of Tank sluice with a tower head.
3. Design principle of Canal drop-Notch type and Canal regulator.
4. Design principle of Under tunnel.
5. Design principle of 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. Under tunnel
6. Syphon aqueduct type III

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

Text Books:

1. C. Satyanarayana Murthy, “Water Resources Engineering – Principles and Practice”, New age International Publishers.

Reference:

1. S. K. Garg, “Irrigation Engineering and Hydraulic Structures”, Standard Book House.
2. B. C Punmia & Lal, “Irrigation and Water Power Engineering”, Lakshmi Publications Pvt. Ltd., New Delhi.

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Subject	PEC-V: (b) SOLID WASTE MANAGEMENT				
Year/semester	IV B.Tech/I Sem	L	T	P	C
Regulation year	R – 20	3	0	0	3

Course Objectives:

1. To understand sources and characteristics and acquire an understanding reduction, storage, recycling of solid waste.
2. To familiarize the different waste collection systems, transfer and transport, and study the importance of processing techniques.
3. To describe different disposal methods.

Course Outcomes:

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

1. Identify sources and characteristics of solid waste.
2. Understand reduction, storage and recycling of solid waste
3. Analyze the collection route and transfer and transport
4. Select suitable waste processing techniques
5. Design a suitable sanitary landfill for disposal of solid waste

SYLLABUS:

UNIT - I

Sources and Characteristics: Introduction; Sources and types of municipal solid waste; Public health and environmental impacts of improper disposal of solid waste; Properties of solid waste – Physical and chemical composition, changes in composition; Factors affecting waste generation rate; Elements of integrated solid waste management; Requirements and salient features of solid waste management rules (2016).

UNIT - II

Source Reduction, Waste Storage And Recycling: Waste Management Hierarchy – Reduction – source reduction, Reuse and Recycling; Storage - On-site storage methods, effect of storage, materials used for containers; Segregation of solid wastes – manual, mechanical; Public health and economic aspects of open storage; Case studies under Indian conditions; Recycling

UNIT - III

Collection, Transfer And Transport: Collection- services, types of collection systems, factors considered for laying routes; Transfer and transport – economic comparison of transport alternatives, transfer station- selection, location, transfer means and methods; Pneumatic transport.

UNIT - IV

Processing Of Wastes: Objectives of waste processing; Processing techniques – Factors considered for onsite processing equipment, Mechanical volume reduction, thermal volume reduction, manual components separation; Resource recovery from solid waste- composting - aerobic and anaerobic, Thermal processing – Combustion, Incineration, Pyrolysis; Energy Recovery Systems – Options with steam turbine generator and gas turbine generator.

UNIT - V

Waste Disposal: Land disposal of solid waste - Sanitary landfills – factors considered for site selection, Land filling methods and operations – Area method, trench method; Design and operation of landfills - important factors that must be considered; Capacity of disposal site

Text Books:

1. Metcalf and Eddy, “Wastewater engineering - Treatment & Reuse”, TATA Mc Graw Hill.
2. S.K. Garg, “Sewage Disposal and Air Pollution Engineering”, Environmental Engineering Vol. II, Khanna Publishers.
3. B.C. Punmia, “Waste water Engineering, Environmental Engineering.”

Reference Books:

1. Peavy, H.S, Rowe, D.R., and G. Tchobanoglous, “Environmental Engineering”, McGraw Hill Inc., New York, 2017.
2. Frank Kreith and George Tchobanoglous, “Handbook of Solid Waste Management”, McGraw-Hill, 1994.

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DEPARTMENT OF CIVIL ENGINEERING

Subject	PEC-V: (c) URBAN HYDROLOGY				
Year/semester	IV B.Tech/I Sem	L	T	P	C
Regulation year	R - 20	3	0	0	3

Course Objectives:

1. Appreciate the impact of urbanization on catchment hydrology
2. Understand the importance of short duration rainfall runoff data for urban hydrology studies.
3. Learn the techniques for peak flow estimation for storm water drainage system design.

Course Outcomes:

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

1. Develop intensity duration frequency curves for urban drainage systems.
2. To analyse the precipitation analysis.
3. Develop design storms to size the various components of drainage systems.
4. Apply best management practices to manage urban flooding.
5. Prepare master drainage plan for an urbanized area.

SYLLABUS:

UNIT - I

Introduction: Urbanisation and its effect on water cycle – urban hydrologic cycle – trends in urbanisation – Effect of urbanisation on hydrology.

UNIT - II

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

UNIT - III

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

UNIT - IV

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

Analysis and Management: Storm water drainage structures, design of storm water network-Best Management Practices–detention and retention facilities, swales, constructed wetlands, models available for storm water management.

UNIT - V

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

Text Books:

1. Geiger W. F., J Marsalek, “Manual on Drainage in Urbanised area”, W. J. Rawls and F. C. Zuidema, (1987 – 2 volumes), UNESCO,
2. Hall M J (1984), “Urban Hydrology” Elsevier Applied Science Publisher.
3. Wanielista M P and Eaglin (1997), “Hydrology – Quantity and Quality Analysis”, Wiley and Sons.
4. Akan A.O and R.L. Houghtalen (2006), “Urban Hydrology, Hydraulics and Storm water Quality: Engineering Applications and Computer Modelling”, Wiley International.

References:

1. Stahre P and Urbonas B (1990), “Stormwater Detention for Drainage”, Water Quality and CSO Management, Prentice Hall.
2. Marsalek et al (2006), “Urban water cycle processes and interactions”, Publication No. 78, UNESCO, Paris
3. Maksimovic C and J A Tejada-Guibert (2001), “Frontiers in Urban Water Management – Deadlock or Hope”, IWA Publishing.

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DEPARTMENT OF CIVIL ENGINEERING

Subject	PEC-V: (d) EARTH RETAINING STRUCTURES				
Year/semester	IV B.Tech/I Sem	L	T	P	C
Regulation year	R - 20	3	0	0	3

Course Objectives:

1. To understand lateral earth pressure theories and pressure theories and design of retaining walls.
2. To design anchored bulkheads by different methods.
3. To understand pressure envelops and design of various components in braced cuts and cofferdams.

Course Outcomes:

1. Quantify the lateral earth pressures associated with different earth systems.
2. Evaluate the mechanical properties of geosynthetics used for soil reinforcement.
3. Identify the merits and demerits of different earth retaining systems.
4. Select the most technically appropriate type of retaining wall for the application from a thorough knowledge of available systems.
5. Design of retaining structures using appropriate design methods, factors of safety, earth pressure diagrams and field verification methods.

SYLLABUS:

UNIT - I

Lateral Pressure: Basic concepts, Rankine and Coulomb earth pressure theories, graphical methods. Determining active and passive pressures: Culmanns, Rebhan's, logarithmic spiral methods, friction circle method. Consideration of surcharge, seepage, earth quake, wave effect, stratification, type of backfill, wall friction and adhesion. Retaining walls: Uses, types, stability and design principles of retaining walls, backfill drainage, settlement and tilting.

UNIT - II

Anchored bulkheads: Classification of anchored bulkheads, free and fixed earth support methods. Rowe's theory for free earth supports and equivalent beam methods for fixed earth supports. Design of anchored rods and dead man.

UNIT - III

Braced cuts and Cofferdams: Braced excavations and stability of vertical cuts, lateral pressures in sand and clay, Braced and cellular cofferdams: uses, types, components, stability, piping and heaving. Stability of cellular cofferdams, cellular cofferdams in rock and in deep soils.

UNIT - IV

Earth dams- Stability analysis: Classification, seepage control in embankments and foundations, seepage analysis, stability analysis: upstream and down stream for steady seepage, rapid draw down, end of construction, method of slices and Bishop's method.

UNIT - V

Earth dams -Protection & Construction: Slope protection, filters, embankment construction materials and construction, quality control, grouting techniques. Instrumentation and performance observations in earth dams.

Text Books:

1. Gopal Ranjan & ASR Rao, "Basic & Applied soil mechanics", New Age International Publishers, 2011.
2. Sharma Hd , "Embankment Dams", Publisher: India Book House(IBH) Limited,1991
3. B. Singh & R. S. Varshney, "Engineering for Embankment Dams", A ABalkema Publishers, 1995
4. W. C. Teng, "Foundation design", Prentice Hall, 1962.

References:

1. Bowles. J. W McGraw Hill, "Analysis and design of foundations", 4th edition, 1955.
2. Bowles. J. W McGraw Hill, "Earth and Rock-Fill Dams: General Design and Construction Considerations", University Press of the Pacific,2004
3. Karl Terzaghi, Ralph B. Peck, "Soil mechanics in engineering and practice", Gholamreza Mesri, 3rd Edition. Wiley India Pvt Ltd, 2010.

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DEPARTMENT OF CIVIL ENGINEERING

Subject	OEC/JOE-III: (a) REPAIR & REHABILITATION OF STRUCTURES				
Year/semester	IV B.Tech/I Sem	L	T	P	C
Regulation year	R - 20	3	0	0	3

Course Objective:

1. Study the assessment, maintenance and repair techniques of concrete structures.
2. Different case studies are analyzed to define the best strategy to maintain and repair the structure.
3. Identify scope of rehabilitation work for dilapidated / obsolete buildings.

Course Outcomes:

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

1. Recognize the mechanisms of degradation of concrete structures and to design durable concrete structures.
2. Conduct field monitoring and non-destructive evaluation of concrete structures.
3. Design and suggest repair strategies for deteriorated concrete structures including repairing with composites.
4. Understand the methods of strengthening methods for concrete structures
5. Assessment of the serviceability and residual life span of concrete structures by Visual inspection and in situ tests

SYLLABUS:

UNIT - I

Materials for repair and rehabilitation: Admixtures- types of admixtures- purposes of using admixtures- chemical composition- Natural admixtures- Fibres- wraps- Glass and Carbon fibre wraps- Steel Plates- Non destructive evaluation: Importance- Concrete behavior under corrosion, disintegrated mechanisms- moisture effects and thermal effects – Visual investigation- Acoustical emission methods- Corrosion activity measurement- chloride content – Depth of carbonation- Impact echo methods- Ultrasound pulse velocity methods- Pull out tests.

UNIT - II

Strengthening and stabilization: Techniques- design considerations- Beam shear capacity strengthening- Shear Transfer strengthening- stress reduction techniques- Column strengthening- flexural strengthening- Connection stabilization and strengthening, Crack stabilization.

UNIT - III

Bonded installation techniques: Externally bonded FRP- Wet layup sheet, bolted plate, near surface mounted FRP, fundamental debonding mechanisms-intermediate crack debonding- CDC debonding- plate end debonding- strengthening of floor of structures.

UNIT - IV

Techniques for Repair: Rust eliminators and polymers coating for rebars during repair, foamed concrete, mortar and dry pack, vacuum concrete, Gunite and shotcrete Epoxy injection, Mortar repair for cracks, shoring and underpinning. Repairs to Masonry Structures & Temples: Damages to masonry structures – Repairing techniques, Damages to temples – Repairing techniques. Foundation Problems: Settlement of soils – Repairs, Sinking of piles – Repairs.

UNIT - V

Corrosion of Reinforcement: Preventive measures – Coatings – Use of SBR modified cementitious mortar, Epoxy resin mortar, Acrylic modified cementitious mortar, Flowing concrete.

Text Books:

1. Neville & Brooks, “Concrete technology”.
2. Rafat Siddique , “Special Structural concrete”.

References:

1. Peter H Emmons, “Concrete repair and maintenance illustrated”.
2. M S Shetty, “Concrete Technology”.

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DEPARTMENT OF CIVIL ENGINEERING

Subject	OEC/JOE-III: (b) DISASTER MANAGEMENT & MITIGATION				
Year/semester	IV B.Tech/I Sem	L	T	P	C
Regulation year	R - 20	3	0	0	3

Course Objectives:

1. To impart knowledge of causes of various disaster and its impact
2. To understand the concept of Disaster Management Cycle and Framework
3. To explain the Applications of Science and Technology for Disaster Management & Mitigation.

Course Outcomes:

After learning the course the students should be able to:

1. Understand disasters, disaster preparedness and apply the mitigation measures.
2. Understand role of IT, remote sensing, GIS and GPS in risk reduction.
3. Apply knowledge of disaster management acts and guidelines.
4. Get to know natural as well as manmade disaster and their extent and possible effects on the economy.
5. Plan of national importance structures based upon the previous history.

SYLLABUS:

UNIT – I

Introduction: Understanding the Concepts and definitions of Disaster and its types, Hazard, Vulnerability, Risk, Capacity, Disaster and Development, and disaster management.

UNIT - II

Consequences and Control of Disasters: Geological, Hydro-Meteorological, Biological, Technological and Man- made Disasters, Global Disaster Trends, Emerging Risks of Disasters, Climate Change and Urban Disasters.

UNIT - III

Disaster Management Cycle and Framework: Disaster Management Cycle, Paradigm Shift in Disaster Management Pre-Disaster Risk Assessment and Analysis, Risk Mapping, zonation and Micro zonation, Prevention and Mitigation of Disasters, Early Warning System; Preparedness, Capacity Development, Awareness During Disaster Evacuation, Disaster Communication, Search and Rescue, Emergency Operation Centre, Incident Command System, Relief and Rehabilitation, Damage and Needs Assessment, Restoration of Critical Infrastructure, Early Recovery, Reconstruction and Redevelopment, IDNDR, Yokohama Strategy, Hyogo Framework of Action.

UNIT - IV

Disaster Management in India: Disaster Profile of India, Mega Disasters of India and Lessons Learnt, Disaster Management Act 2005, Institutional and Financial Mechanism, National Policy on Disaster Management, National Guidelines and Plans on Disaster Management, Role of Government, Non-Government and Inter-Governmental Agencies.

UNIT – V

Applications of Science and Technology for Disaster Management & Mitigation: Geo-informatics in Disaster Management, Disaster Communication System, Land Use Planning and Development Regulations, Structural and Non Structural Mitigation of Disasters, S&T Institutions for Disaster Management in India.

Text Books:

1. Disaster Management Guidelines, GOI-UND Disaster Risk Program (2009-2012)
2. Damon, P. Copola, (2006), "Introduction to International Disaster Management", Butterworth Heineman.
3. Gupta A.K., Niar S.S and Chatterjee S. (2013), "Disaster management and Risk Reduction, Role of Environmental Knowledge", Narosa Publishing House, Delhi.

Reference:

1. Murthy D.B.N. (2012), "Disaster Management", Deep and Deep Publication PVT. Ltd. New Delhi.
2. Modh S. (2010), "Managing Natural Disasters", Mac Millan publishers India LTD.

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DEPARTMENT OF CIVIL ENGINEERING

Subject	OEC/JOE-IV: (a) SMART CITY PLANNING AND DEVELOPMENT				
Year/semester	IV B.Tech/I Sem	L	T	P	C
Regulation year	R - 20	3	0	0	3

Course Objectives:

Students will be able to

1. To develop overall city strategy to become contemporary and competitive with smart system and to understand risk and feasibility to ensure the economic health of the city through smart technology implementations.
2. To understand smart community, smart transportation and smart buildings and to identify smart system to city water supply and drainage network issues.
3. To apply smart technologies across the spectrum of infrastructure, E-Governance and IOT enabled services**.**

Course Outcomes:

Students shall be able to

1. Explore and understand the fundamental concepts of smart and sustainable cities.
2. Explain the component of smart cities and study current technological advancements.
3. Plan smart solutions for present Urban Transport problems
4. Develop smart solutions for water supply and drainage problems
5. Identify and recognize the role of E-governance and IoT solutions

SYLLABUS:

UNIT – I

Introduction: Understanding – Dimensions – Global experience, Global standards and performance benchmarks, Practice codes. India 100 smart cities policy and mission, Smart city planning and development, Financing smart cities development, Governance of smart cities.

UNIT – II

Smart Cities Planning and Development: Introduction to smart community – smart community concepts: concept of smart community – smart transportation – smart building and home devices – smart health – smart government – smart energy and water – cyber security, safety and privacy – Internet of Things, Blockchain, Artificial Intelligence, Virtual Reality.

UNIT – III

Smart Urban Transport Systems: Elements of Infrastructure (Physical, Social, Utilities and services), Basic definitions, concepts, significance and importance; Data required for provision

and planning of urban networks and services; Resource analysis, Provision of infrastructure. Role of transport, types of transport systems, evolution of transport modes, transport problems and mobility issues. Urban form and Transport patterns, land use – transport cycle, concept of accessibility. Hierarchy, capacity and geometric design elements of roads and intersections. Basic principles of Transport infrastructure design. Urban transport planning process –Transport, environment and safety issues. Principles and approaches of Traffic Management, Transport System Management.

UNIT – IV

Smart water supply and drainage:

Water Supply: sources of water, treatment and storage, transportation and distribution, quality, networks, distribution losses, water harvesting, recycling and reuse, norms and standards of provision, institutional arrangements, planning provisions and management issues.

Drainage and Wastewater: Wastewater Collection and Conveyance, Design of Waste stabilization Ponds, Lagoons, Root Zone Treatment Systems, Membrane bioreactors, fluidized bed reactors, Hybrid Systems, Anaerobic systems for wastewater treatment, Design of Septic tank, Sludge Treatment and Disposal, Design of Digester Tank, Sludge Dewatering and Ultimate Disposal.

UNIT – V

E-Governance and IoT: The concept of management, concept of e-management & e -business, e-Government Principles, Form e-Government to e-governance, e-governance and developing countries, Designing and Implementing e-Government Strategy, E governance: Issues in implementation. IOT fundamentals, protocols, design and development, data analytics and supporting services, casestudies.

Text Books:

1. Katherine S. Willis, “The Routledge Companion to Smart Cities”, Allessandro Aurigi, Routledge International Handbooks, 2020.
2. Society 5.0: A People-centric super-smart society, Hitachi-Tokyo Laboratory (H-Tokyo lab), Springer, 2020.
3. G.R. Kangachidambersan, R. Maheswar, V. Manikandan, K. Ramakrishnan, “Internet of Things in Smart Technologies for Sustainable Urban Development”, Springer, 2020.

References:

1. Allen G.Noble, (Eds), “Regional Development and Planning for the 21st Century: New Priorities and New Philosophies”, Aldershot, USA, 1988.

2. Andy Pike, Andres Rodriguez-Pose, John Tomaney, “Handbook of Local and RegionalDevelopment”, Taylor & Francis, 2010.
3. Daniel G. Parolek, AIA, Karen Parolek, Paul C. Crawford, FAICP, Form Based Codes: A Guide for Planners, Urban Designers, Municipalities, and Developers, John Wiley & Sons, 2008.

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Subject	OEC/JOE-IV: (b) GREEN BUILDING TECHNOLOGIES				
Year/semester	IV B.Tech/I Sem	L	T	P	C
Regulation year	R - 20	3	0	0	3

Course Objectives:

1. To learn about the environmental Implications of building construction materials.
2. To learn about suitable Industrial waste materials including Biomass materials that can be used as construction material for various Infra Projects and to understand Thermal characteristics and heat flow characteristics of building materials.
3. To study about non-conventional energy resources like solar energy and different case studies and to learn about management of water, solid waste and sewage.

Course Outcomes:

Upon completion of this course, students should be able to

1. Explain environmental Implications of building construction materials.
2. Understand various concepts of building materials, alternative materials, biomass resources and recycling of Industrial and Building wastes.
3. Understand the impact of continued use of non-renewable energy resources.
4. Investigate renewable energy systems.
5. Understand energy consumption, efficiency and waste management.

SYLLABUS:

UNIT – I

Introduction: Environmental implications of buildings energy, carbon emissions, water use, waste Disposal. Building materials: sources, methods of production and environmental Implications. Green cover and built environment

UNIT - II

Implications of Resources: Implications of resources for Building Materials and alternative concepts. Recycling of Industrial and Buildings Wastes. Biomass Resources for buildings

UNIT – III

Comforts in Building: Comforts in Building: Thermal Comfort in Buildings- Issues; Heat Transfer Characteristic of Building Materials and Building Techniques. Incidence of Solar Heat on Buildings.

UNIT - IV

Energy Conservation: Utility of Solar energy in buildings concepts of Solar Passive Cooling

and Heating of Buildings. Low Energy Cooling. Case studies of Solar Passive Cooled and Heated Buildings.

UNIT – V

Green Composites for Buildings and Waste Management: Green Composites for buildings: Concepts of Green Composites. Water Utilization in Buildings Waste Management: Low Energy Approaches to Water Management. Management of Solid Wastes. Management of Sullage Water and Sewage.

Text Books:

1. K.S.Jagadish, B. U. Venkataramareddy and K. S. Nanjundarao, “Alternative Building Materials and Technologies”, New Age International, 2007.
2. Michael Bauer, Peter Mösle and Michael Schwarz, “Green Building - Guidebook for Sustainable Architecture”, Springer, 2010

References:

1. Osman Attmann, “Green Architecture Advanced Technologies and Materials”, McGraw Hill, 2010.
2. Michael F. Ash, “Materials and the Environment”, Elsevier, 2009.
3. Jerry Yudelson, “Green building Through Integrated Design”, McGraw Hill, 2009.
4. Mili M. Ajumdar (Ed), “Energy Efficient Building in India”, Teri and Mnes, 2001/2002.
5. Low Energy Cooling For Sustainable Buildings. John Wiley and Sons Ltd, 2009.
6. Green My Home!: 10 Steps to Lowering Energy Costs and Reducing Your Carbon Footprint, by Dennis C. Brewer, ISBN:9781427798411, Publisher: Kaplan Publishing, Publication Date: October 2008.
7. B. Givoni, Man, “Climate and Architecture”, Elsevier, 1969.
8. T. A. Markus and E. N. Morris, “Buildings Climate and Energy”, Pitman, London, 1980. Arvind Kishan et al (Ed)

VISHNU INSTITUTE OF TECHNOLOGY: BHIMAVARAM
(AUTONOMOUS)
DEPARTMENT OF CIVIL ENGINEERING

Subject	HSSE : (a) FUNDAMENTALS OF ENTREPRENEURSHIP				
Year/semester	IV B.Tech/I Sem	L	T	P	C
Regulation year	R - 20	3	0	0	3

Course Objective:

1. The objective of the course is to make students understand the fundamentals of entrepreneurship and make students to take their career in entrepreneurship.

Course Outcomes:

1. Understand the concept and importance of entrepreneurship.
2. Know the various means of generating business ideas.
3. Know the various legal aspects involved in forming the business.
4. Able to write a business plan.
5. Know the role of Government and Various Agencies in promoting entrepreneurship.

SYLLABUS

UNIT - I

Fundamentals of Entrepreneurship: Entrepreneurship; Entrepreneurial Traits, Types of Entrepreneurs; Evolution of Entrepreneurship; Myths of Entrepreneurship; Difference between Inventors & Entrepreneurs; Role of Entrepreneurship; Entrepreneurial Ethics & Social Responsibilities & Ease of doing business in India.

UNIT - II

Creativity, Innovation& Start-Ups: Introduction; Creativity & Entrepreneurship; Components of Creativity; Characteristics of Creative People; Sources of New Ideas; Techniques for Generating Ideas. Innovation & the Entrepreneur: The innovation Process; Types of Innovation; Major Misconceptions of Innovation; Principles of Innovation.

Start-Ups: Start-Ups; Types of Start-Ups; Start-Ups in India; start-Ups failures & reasons; Managing start-Ups during down turn.

UNIT - III

Legal Aspects of Business: Procedures for setting up a Business in India; Legal Aspects governing businesses in India-IP law, labor law, safety law, contract law, corporate law & taxation law.

UNIT - IV

Business Plan: Business plan; Drivers of Business plan; Basics of Business plan; Reasons for Failure of Business plans; Growth strategies for Ventures: Franchising, Licensing, Joint Ventures, Mergers & Acquisitions.

UNIT - V

Institutions that facilitate Entrepreneurship & Entrepreneurship Development: National Institute for MSME, NIESBUD; Ministry of MSME; EDI; National Entrepreneurship Network (NEN); National science & Technology Entrepreneurship Development Board (NSTEDB); ISB: Wadhwani Centre for Entrepreneurship Development (WCED).

Text Books:

1. Arya Kumar: “Entrepreneurship”, Pearson, Publishing House, New Delhi, 2012.
2. VSP Rao, Kuratko: “Entrepreneurship”, Cengage Learning, New Delhi.

References:

1. Rajeev Roy: “Entrepreneurship”, Oxford University Press, New Delhi, 2012.
2. The Dynamics of Entrepreneurial Development and Management, Vasant Desai, Himalaya House, 2015.

VISHNU INSTITUTE OF TECHNOLOGY: BHIMAVARAM
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DEPARTMENT OF CIVIL ENGINEERING

Subject	HSSE : (b) MANAGERIAL ECONOMICS & MANAGEMENT SCIENCE				
Year/semester	IV B.Tech/I Sem	L	T	P	C
Regulation year	R - 20	3	0	0	3

Course Objectives:

1. The purpose of this course is to apply micro economic concepts and techniques in evaluating business decisions.
2. To familiarize with the process of management and to provide basic insight into management practices.

Course Outcomes:

1. Gain knowledge in basic economic tools in managerial economics and demand analysis.
2. Analyze the production, cost concepts of a firm.
3. Understand the relationship of pricing, markets and capital budgeting in big industries.
4. Students will acquire the knowledge on management functions.
5. To familiarize with the process of management and to provide basic insights into contemporary management practices.

SYLLABUS

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

UNIT – II

Production and Cost Analysis: Concept of Production function- Cobb-Douglas 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(simple problems)Managerial significance and limitations of Breakeven point..

UNIT – III

Introduction to Markets & Pricing Policies: Market structures: Perfect competition, Monopoly and Monopolistic and oligopoly – Features -Price-Output Determination. Methods of Pricing-Limit Pricing, Market Skimming Pricing and Internet Pricing Models.

Capital and Capital Budgeting: Capital Budgeting: Meaning of Capital – Capitalization – Meaning of Capital budgeting - need for capital budgeting- Techniques of Capital budgeting – Traditional and Modern methods.

UNIT – IV

Introduction to Management: Concept –nature and importance of Management –Functions of Management – Henry Fayol's 14 principles of management- F.W.Taylor Management Principles-Theories of Motivation – Decision making process-– Types of Organizational structure.

UNIT – V

Contemporary Management Practices: Basic concepts of MRP, Total Quality Management (TQM), Six sigma, Business process Re-engineering and Bench Marking, Balanced Score Card.

Text Books:

1. L.M.Prasad- Principles and Practice of Management, Sultan Chand & Sons, New Delhi
2. Koontz &Weihrich: 'Essentials of management' TMH 2011
3. Managerial Economics-Theory & Applications-D.M.Mithani, HPH, New Delhi
4. Financial Management-G.Sudharsan Reddy-HPH, New Delhi

References:

1. Dr. A. R. Aryasri – Managerial Economics and Financial Analysis, TMH 2011
2. Prof. J.V.Prabhakararao, Prof. P. Venkatrao. 'Managerial Economics and Financial Analysis', Ravindra Publication
3. Dr. A. R. Aryasri, Management Science' TMH 2011

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DEPARTMENT OF CIVIL ENGINEERING

Subject	HSSE : (C) BUSINESS ENVIRONMENT				
Year/semester	IV B.Tech/I Sem	L	T	P	C
Regulation year	R - 20	3	0	0	3

Course Objectives:

1. Student should be able to outline how an entity operates in a business environment.

Course Outcomes:

1. To understand the overall business environment and evaluate its various components in business decision making.
2. To improve the students ability in recognizing and managing legal risks in business decision making.
3. The course is designed to expose the student to the career fields in the area of business.

SYLLABUS

UNIT – I

Business Environment: Importance at national and international level – problems and challenges– factors both internal and external influencing business environment, Industrial policies since independence and their significance.

UNIT – II

Structure of Indian economy: Nature and significance – Economic systems – structure of Indian industry – nature – challenges – social justice –competition Act 2002.

Fiscal Policy: Nature and significance – public revenues – Critical analysis of the recent fiscal policy of Government of India.

UNIT – III

India's Trade Policy: Nature–bilateral and multilateral trade agreements, International business environment: Nature – significance– challenges and mechanisms-Overview of IMF, WTO-disputes settlement mechanism – dumping and antidumping measures.

UNIT – IV

Legal Frame: special features of the SICA (special provisions) 1985, BIFR, Consumer protection act 1986, Environmental laws (pertaining to the control and prevention of Air and Water pollution), the Essential Commodities Act 1955 & GST Act 2017.

UNIT – V

Disinvestment mechanism: problems and procedures- new industrial policy 1991- NITI Ayog- Balance of Payments – Causes for disequilibrium in Balance of Payments – Correction measures.

Text Books:

1. Aswathappa K:"Essentials of business environment" Himalaya Publishing House, New Delhi,2011
2. Francis Cherunilam"Business Environment: Text&Cases"HPH, 2012
3. Shaikh Saleem: "**Business Environment**", Pearsons, New Delhi
4. Veena Keshav Pailwar: "**Economic Environment of Business**", PHI Learning, New Delhi, 2012.

References:

1. Vivek Mittal: "**Business Environment Text and Cases**", Excel Books New Delhi, 2011.
2. Sundaram and Black: "**International Business Environment Text and Cases**", PHI PrivateLimited, New Delhi.
3. Avid W Conklin: "**Cases in Environment of Business**", Sage Publication India Private Ltd, New Delhi.
4. Raj Kumar: "**International Business Environment**", Excel Publication, New Delhi, 2012.
5. Palle Krishna Rao: "**WTO-Text and Cases**", Excel Publication, New Delhi.

VISHNU INSTITUTE OF TECHNOLOGY: BHIMAVARAM
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DEPARTMENT OF CIVIL ENGINEERING

Subject	COMPUTER AIDED PROJECT MANAGEMENT LABORATORY				
Year/semester	IV B.Tech/I Sem	L	T	P	C
Regulation year	R - 20	3	0	0	3

Course Objectives:

The main objective of this Microsoft Project training is to empower project management professionals with:

1. A complete skill set, confidence and knowledge required to manage projects using Microsoft Project.
2. The necessary confidence, experience and knowledge to train other stakeholders and professionals about using Microsoft Project.
3. The adequate capability to design and plan projects using Microsoft Project.

Course Outcomes:

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

1. In this Microsoft Project training course, you'll learn about how to use this Microsoft Project software. It is the most popular project management software in the world developed and sold by Microsoft. It has been designed to help project managers in developing plans, assigning resources to specific tasks, tracking progress, managing costing and budgets and analysing workload.
2. It encourages project managers to follow industry-standard best practices related to project management.
3. Microsoft Project has various features through which all critical aspects of project management can be addressed, such as planning and scheduling, collaboration, reporting, resource management, etc.
4. Different classes of users have differing access levels to different features of the software and stages of the project, including different views and data.
5. In the present scenario with the advance in technology in all fields of work, using software to manage projects is the most effective choice. It not only saves time but also eliminates the chances of manual error.

List of Experiments:

1. Introduction of project planning and scheduling.
2. Setting out non-working days in the project calendar.
3. Assigning job and plan's title and other properties.
4. To prepare a task list of a project entering task names.

5. Building a task list; Enter task durations, and start and finish values.
6. Building a task list; entering a milestone task.
7. Building a task list; creating summary tasks to outline the plan.
8. Building a task list; creating task dependencies with links.
9. Formatting and sharing the plan; customizing a Gantt chart view.
10. Formatting and sharing the plan; Customizing reports, Copying views and reports.

VISHNU INSTITUTE OF TECHNOLOGY: BHIMAVARAM
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DEPARTMENT OF CIVIL ENGINEERING

GENERAL MINOR COURSES OFFERED BY CIVIL ENGINEERING DEPARTMENT TO OTHER (NON- CORE) DEPARTMENTS

S. No.	Course Year	Course Title	L-T-P	Credit
1	II B.Tech. II Sem.	Concrete Technology	3-0-0	4
2	III B.Tech. I Sem.	Building Planning	3-0-0	4
3	III B.Tech. II Sem.	Surveying	3-0-0	4
4	IV B.Tech. I Sem.	Strength of Materials	3-0-0	4
5	IV B.Tech. II Sem.	MOOCS – I : Fluid Mechanics	3-0-0	4
6	IV B.Tech. II Sem.	MOOCS – II : Structural Analysis	3-0-0	4

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DEPARTMENT OF CIVIL ENGINEERING

Subject	CONCRETE TECHNOLOGY				
Year / semester	III B.Tech. / I Sem.	L	T	P	C
Regulation year	R - 20	3	0	0	3

Course Objectives:

1. To understand the properties of ingredients of concrete and to study the behavior of concrete at its fresh and hardened state.
2. To study about the concrete design mix and to know about the procedures in concrete at different stage.
3. To understand special concrete and their uses.

Course Outcomes:

1. To identify suitable materials to be used in the cement concrete by conducting various tests as per BIS code.
2. Test all the concrete materials as per BIS code and design the concrete mix using ACI and BIS code methods.
3. Determine the properties of fresh and hardened of concrete.
4. Design special concretes and their specific applications and use of admixtures.
5. Ensure quality control while testing/ sampling and acceptance criteria for pre and post construction work and use of non-destructive testing equipment.

SYLLABUS

UNIT - I

Introduction: Concrete materials, Cement: Field and laboratory tests on cement, Types of cement and their uses, different tests for aggregates. Methods for manufacturing of cement- Wet and dry process. Hydration of cement, Bogue's compound.

UNIT - II

Admixtures: Accelerating admixtures, Retarding admixtures, water reducing admixtures, Air entraining admixtures, colouring agent, Plasticizers. Batching, Mixing, Transportation, Placing of concrete, curing of Concrete.

UNIT - III

Behaviour of Concrete: Strength of concrete, Shrinkage and temperature effects, creep of concrete, permeability of concrete, durability of concrete, Corrosion, Causes and effects, remedial measures, Thermal properties of concrete, Micro cracking of concrete.

UNIT - IV

Mix Design: Factors influencing mix proportion, Mix design by ACI method and I.S. code method, Design of high strength concrete.

UNIT – V

Special Concrete: Light-weight concrete, Fibre reinforced concrete, Polymer modified concrete, Ferro cement, Mass concrete, Ready-mix concrete, Self-compacting concrete, Quality control, Sampling and testing, Acceptance criteria.

Text books:

1. Shetty, M.S., Concrete Technology, Theory & Practice, S.Chand and Co.
2. Gambhir, M.L., Concrete Technology, Tata McGraw Hill.
3. Santakumar A.R., Concrete Technology, Oxford University Press, New Delhi.

References:

1. Nevile, Properties of Concrete, Longman Publishers.

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DEPARTMENT OF CIVIL ENGINEERING

Subject	BUILDING PLANNING				
Year / semester	II B.Tech. / II Sem.	L	T	P	C
Regulation year	R - 20	3	0	0	3

Course Objectives:

1. Initiating the student to different building bye-laws and regulations.
2. Imparting the planning aspects of residential buildings and public buildings.
3. Giving training exercises on various signs and bonds and different building units.

Course Outcomes:

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

1. Prepare, read and interpret the drawings in a professional set up.
2. Prepare line plans of residential and public buildings using principles of planning.
3. Prepare submission and working drawing from the given requirement for Load Bearing Structure.
4. Prepare submission and working drawing from the given requirement for Framed Structure.
5. Draw Two point perspective drawing for given small objects.

SYLLABUS

UNIT - I

To prepare working drawing of component of buildings i) Stepped wall footing and isolated RCC column footing, ii) Fully paneled and flush doors, iii) Half paneled and half-glazed window, iv) RCC dog legged and open well stairs, v) Steel truss.

UNIT - II

Functional design of building (Residential, Public and Industrial), positioning of various components of buildings, orientation of buildings, building standards, bye laws, set back distances and calculation of carpet area, plinth area and floor area ratio.

UNIT - III

Development of plan, elevation, section and schedule of openings from the given line diagram of residential buildings, i) Two bed room building, ii) Two storeyed building.

UNIT - IV

Functional design of building using inter connectivity diagrams (bubble diagram), development of line diagram only for fallowing building i) Primary health centre, ii) Primary school building, iii) College canteen iv) Office building

UNIT - V

For a given single line diagram, preparation of water supply, sanitary and electrical layouts**.**

Text Books:

1. MG Shah, CM Kale, SY Patki, "Building drawing with an integrated approach to Built Environment Drawing" , Tata McGraw Hill Publishing co. Ltd., New Delhi.
2. Gurucharan Singh, "Building Construction", Standard Publishers, & distributors, New Delhi.
3. Malik R S and Meo G S, "Civil Engineering Drawing", Asian Publishers/Computech Publications Pvt Ltd.

References Books:

1. Time Saver Standard by Dodge F. W., F. W. Dodge Corp.
2. IS: 962-1989 (Code of practice for architectural and building drawing).
3. National Building Code, BIS, New Delhi.

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DEPARTMENT OF CIVIL ENGINEERING

Subject	SURVEYING				
Year / semester	III B.Tech. / II Sem.	L	T	P	C
Regulation year	R - 20	3	0	0	3

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

1. To demonstrate the basic surveying skills
2. To use various surveying instruments and to perform different methods of surveying
3. To compute various data required for various methods of surveying.

Course Outcomes:
Course will enable the student to:

1. Apply the knowledge to calculate angles, distances and level.
2. Identify data collection methods and prepare field notes.
3. Understand the working principles of survey instruments, measurement errors and corrective measures.
4. Interpret survey data and compute areas and volumes.
5. 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.

Measurement of Distances and Directions

Linear Distances- Approximate methods, Direct Methods-Accessories in chain surveying- Chains- Tapes, ranging, Tape corrections.

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

UNIT - II

Plane Table: Accessories and methods of plane table surveying.

Levelling: Concept and Terminology, Levelling Instruments and their Temporary and permanent adjustments- method of levelling.

Contouring: Characteristics and Uses of contours- methods of conducting contour surveys. And their plotting.

UNIT - III

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

Tacheometric Surveying: Stadia and tangential methods of Tacheometry. Distance and Elevation formulae for Staff vertical position.

UNIT - IV

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

Computation Of Areas and Volumes: Area from field notes, computation of areas along irregular boundaries and area consisting of regular boundaries. Embankments and cutting for a level section and two-level sections with and without transverse slopes, determination of the capacity of reservoir, volume of barrow pits.

UNIT - V

Modern Field Survey Systems: Principle of Electronic Distance Measurement, Modulation, Types of EDM instruments, Total Station – Parts of a Total Station – Accessories, Advantages and Applications, Errors in Total Station Survey, Introduction to Global Positioning Systems- Principle - Advantages and Disadvantages- Applications – Segments.

Text Books:

1. Arora, K.R., Surveying, Vol-I, II and III, Standard Book House, 2015.
2. Madhu, N, Sathikumar, R and Satheesh Gobi, Advanced Surveying: Total Station, GIS and Remote Sensing, Pearson India, 2006.
3. B.C.Punmia, Surveying, Vol-I, II and III, Laxmi Publications.
4. Advance Surveying, Satish Gopi, R. Sathi Kumar and N. Madhu, Pearson Publications.
5. Text book of Surveying, C. Venkataramaiah, University press, India Limited.
6. Surveying and levelling, R. Subramanian, Oxford University press.

References:

1. Bhavikatti, S.S., Surveying and Levelling, Vol. I and II, I.K. International, 2010
2. Anji Reddy, M., Remote sensing and Geographical information system, B.S. Publications, 2001.
3. Manoj, K. Arora and Badjatia, Geomatics Engineering, Nem Chand & Bros, 2011
4. Text book of Surveying, S.K. Duggal (Vol No. 1&2), Tata McGraw Hill Publishing Co. Ltd. New Delhi.
5. Text book of Surveying, Arora (Vol No. 1&2), Standard Book House, Delhi.

VISHNU INSTITUTE OF TECHNOLOGY: BHIMAVARAM
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DEPARTMENT OF CIVIL ENGINEERING

Subject	STRENGTH OF MATERIALS				
Year / semester	IV B.Tech. / I Sem.	L	T	P	C
Regulation year	R - 20	3	0	0	3

Course Objectives:

The objective of this course is:

1. To impart preliminary concepts of Strength of Material and Principles of Elasticity and Plasticity Stress conditions and to develop diagrams of variation of various stresses across the length.
2. To give concepts of stresses developed in the cross section and bending equations calculation of section modulus of sections with different cross sections.
3. The concepts above will be utilized in measuring deflections in beams under various loading and support conditions and 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:

1. The student will be able to understand the basic materials behavior under the influence of different external loading conditions and the support conditions.
2. The student will be able to draw the diagrams indicating the variation of the key performance features like bending moment and shear forces.
3. The student will have knowledge of bending concepts.
4. Calculation of section modulus and for determination of stresses developed in the beams and deflections due to various loading conditions.
5. 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 cylindrical shells: Derivation of formula for longitudinal and circumferential stresses - hoop, longitudinal and volumetric strains – changes in diameter, and volume of thin cylinders.

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

Text books:

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

References:

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

VISHNU INSTITUTE OF TECHNOLOGY: BHIMAVARAM
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DEPARTMENT OF CIVIL ENGINEERING

Subject	MOOCS – I : FLUID MECHANICS				
Year / semester	IV B.Tech. / II Sem.	L	T	P	C
Regulation year	R - 20	3	0	0	3

This is an introductory course in Fluid Mechanics. The subject Fluid Mechanics has a wide scope and is of prime importance in several fields of engineering and science. Present course emphasizes the fundamental underlying fluid mechanical principles and application of those principles to solve real life problems. Special attention is given towards deriving all the governing equations starting from the fundamental principle. There is a well balanced coverage of physical concepts, mathematical operations along with examples and exercise problems of practical importance. After completion of the course, the students will have a strong fundamental understanding of the basic principles of Fluid Mechanics and will be able to apply the basic principles to analyze fluid mechanical system.

COURSE LAYOUT:

Week 1: Introduction and Basic Principles

Week 2: Properties of Fluids

Week 3: Properties of Fluids and Fluid Statics

Week 4: Fluid Statics

Week 5: Fluid Kinematics (Part I)

Week 6: Fluid Kinematics (Part II)

Week 7: Dynamics of Inviscid Flows (Part I)

Week 8: Dynamics of Inviscid Flows (Part II)

Week 9: Integral Forms of Control Volume Conservation Equations (Part I)

Week 10: Integral Forms of Control Volume Conservation Equations (Part II)

Week 11: Integral Forms of Control Volume Conservation Equations (Part III); Dynamics of Viscous Flows (Part I)

Week 12: Dynamics of Viscous Flows (Part II)

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DEPARTMENT OF CIVIL ENGINEERING

Subject	MOOCS – II : Structural Analysis				
Year / semester	IV B.Tech. / II Sem.	L	T	P	C
Regulation year	R - 20	3	0	0	3

This is an elementary course on Structural Analysis. Various methods and their underlying mechanics in determining response of structures when subjected to external agitation will be discussed in this course. This course is comprehensive at the basic level. Journey through this course will help students to build the foundation for more advanced courses related to structural engineering.

Course layout:

Week 1: Equilibrium, Stability and Determinacy of structures, Review of shear force and bending moment diagram in beams and frames

Week 2: Analysis of statically determinate structures 1, Plane truss: method of joints and method of sections

Week 3: Analysis of statically determinate structures 2, Deflection of truss: Method of virtual work

Week 4: Analysis of statically determinate structures 3, Deflection of beams and frames 1: Moment area method, conjugate beam method and virtual work method

Week 5: Analysis of statically determinate structures 4, Deflection of beams and frames 2: Moment area method, conjugate beam method and virtual work method

Week 6: Analysis of statically determinate structures 5, Influence line diagram and moving loads

Week 7: Analysis of statically indeterminate structures 1, Introduction to force and stiffness method

Week 8: Analysis of statically indeterminate structures 2, Plane truss using method of consistent deformations

Week 9: Analysis of statically indeterminate structures 3, Beams and Frames: Method of consistent deformations

Week 10: Analysis of statically indeterminate structures 4, Beams and Frames: Moment distribution method

Week 11: Analysis of statically indeterminate structures 5, Beams and Frames: Slope deflection method

Week 12: Introduction to direct stiffness method

Books and references:

1. Devdas Menon, Structural Analysis, Narosa Publishing House, 2008. (ISBN: 9781842653371).
2. Hibbeler, R. C. (2002). Structural Analysis, 6/e, Pearson Education.
3. Norris, C.H., Wilbur, J.B., and Utku, S., Elementary Structural Analysis, McGraw Hill.
4. Wang, C.K., Intermediate Structural Analysis, McGraw Hill, 1983.

VISHNU INSTITUTE OF TECHNOLOGY: BHIMAVARAM
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DEPARTMENT OF CIVIL ENGINEERING

SPECIALIZED MINOR COURSES OFFERED TO CIVIL ENGINEERING DEPARTMENT

S.No.	Course Title	L-T-P	Credit	Pre-Req.
Track - I (Construction Management)				
1.	Prefabricated Techniques and Management	3-0-0	4	-
2.	Construction Planning And Scheduling	3-0-0	4	-
3.	Contract and Administration Planning	3-0-0	4	-
4.	Quality Control And Safety	3-0-0	4	-
Track - II (Techniques in Construction)				
1.	Construction Practices And Equipment	3-0-0	4	-
2.	Formwork for Concrete Structures	3-0-0	4	-
3.	Construction Techniques of Steel and Concrete Composite Structures	3-0-0	4	-
4.	Construction Techniques of Deep Foundations	3-0-0	4	-
Track - III (Structural Engineering)				
1.	Structural Dynamics	3-0-0	4	**SA**
2.	Finite Element Analysis	3-0-0	4	**SA**
3.	Stability of Structures	3-0-0	4	**SA**
4.	Theory of Elasticity	3-0-0	4	**SA**
Track - IV (Transportation Engineering and Management)				
1.	Transportation Planning	3-0-0	4	**URBAN PLANNING**
2.	Intelligent Transportation Systems	3-0-0	4	**TE**
3.	Theory of Traffic Flow	3-0-0	4	**TE**
4.	Pavement Materials	3-0-0	4	**TE**

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Subject	PREFABRICATED TECHNIQUES AND MANAGEMENT				
SPECIALIZED MINOR		L	T	P	C
Regulation year	R - 20	3	0	0	3

Course Objectives:

1. To understand the design principles related to prefabrication elements.
2. To obtain knowledge on the concepts of production and transportation of precast buildings.
3. To obtain knowledge on the concepts of assembling & erection of precast buildings.

Course Outcome:

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

1. Describe various structural systems and standard organizing requirements.
2. Identify and differentiate structural behaviour of building elements and design building elements and applications.
3. Identify and describe working principles of various joints and connections.
4. Apply principles and describe assembling process, identify and describe various tools in assembling and erection of buildings.
5. Design and detail precast and activities by innovation.

SYLLABUS

UNIT – I

Introduction: Types of prefabrication, prefabrication systems and structural schemes- Disuniting of structures- Structural behaviour of precast structures - Specific requirements for planning and layout of prefabrication plant - IS Code specifications.

UNIT – II

Precast Cast Elements: Handling and erection stresses- Application of prestressing of roof members; floor systems two way load bearing slabs, pre stressed beam , Precast column -precast shear walls Wall panels, hipped plate and shell structures.

UNIT – III

Prefabricated Design: Designing and detailing prefabricated units for 1) industrial structures 2) Multistory buildings and 3) Water tanks, silos bunkers etc., 4) Application of prestressed concrete in prefabrication.

UNIT – IV

Joints: Basic mechanism- Dimensioning and detailing of joints for different structural connections; compression joint-shear joint - tension joint

UNIT – V

Connections: Pin jointed connection-moment resisting connections- beam to column- column foundation connections

Prefabricated Buildings: Production, Transportation & erection- Shuttering and mould design Dimensional tolerances- Erection of R.C. Structures, Total prefabricated buildings assembly Process

Machinery and Equipment: Plant machinery, casting yard- casting and stacking

Text books:

1. KimS. Elliot (2017), Precast Concrete Structures, CRC Press

References:

1. Handbook of Precast Concrete Buildings (2016) ICI publications.
2. Ryan E. Smith, (2010), Prefab Architecture: A Guide to Modular Design and Construction, John Wiley and Sons, London.
3. Hubert Bachmann and Alfred Steinle, (2011), Precast Concrete Structures, Wiley VCH.

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Subject	CONSTRUCTION PLANNING AND SCHEDULING				
SPECIALIZED MINOR		L	T	P	C
Regulation year	R - 20	3	0	0	3

Course Objectives:

1. To understand the importance of construction planning and organizational cultures and their impact on a project and to know the relationship between strategic plans and projects and also understand the types of project risks in an organization.
2. To understand the importance of a complete and accurate WBS from a planning and executing point of view and to compute critical path, slack and floats for a given network diagram.
3. To obtain the knowledge of advanced scheduling techniques and to be familiar with computerized scheduling both its limitations and advantages and to prepare resource scheduling such as material, equipment and manpower requirements to execute the project.

Course Outcome:

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

1. Understand the importance of construction planning and organizational cultures.
2. Discuss the relationship between strategic planning and project planning.
3. Construct WBS and compute critical path, slack and floats for a given network diagram.
4. Describe the advanced scheduling techniques and prepare various types of Project Information using Database Management Systems.
5. Create scheduling for material, equipment and manpower requirements to execute the project and estimate costs associated with different construction projects.

SYLLABUS

UNIT – I

Planning: Construction Planning - Organizing, Staffing, directing, and controlling – Factors influence supply and demand of human resources – Role of HR manager – Personnel Principles - case studies

Organizing: Requirement of Organization – Organization structure – Organization charts – Staffing Plan - Development and Operation of human resources.

UNIT – II

Scheduling Techniques: Work Breakdown Structure (WBS) -Time Management and Scheduling -Bar chart and Gantt chart - Network methods - Network diagram - Critical Path Method -Calculation critical path, Floats/slacks - PERT – Three time estimates

UNIT – III

Resource Techniques: Precedence Diagram Method (PDM), Project monitoring - Updating - Target Schedule, Optimum cost and time, Scheduling with uncertain durations-Calculations for Monte Carlo Schedule Simulations-Crashing and Time-Cost Tradeoff

UNIT – IV

Project Information: Types of Project Information - Accuracy and Use of Information - Computerized Organization and Use of Information - Other Conceptual Models of Databases - Centralized - Database Management Systems - Databases and Applications Programs – Information - Transfer and Flow.

UNIT – V

Labour and Material Utilization: Labour requirements, labour productivity, Equipment, Material Management, Inventory Control, Economic order quantity, EOQ for resource limitation, Resource scheduling - leveling and allocation.

Cost Estimation: Costs Associated with Constructed Facilities - Construction Cost Estimates - Historical Cost Data – Cost Indices - Applications of Cost Indices to Estimating - Estimate based on Engineer's List of Quantities - Estimation of Operating Costs.

Text books:

1. Prasanna Chandra, (2017), Project Planning, Analysis, Selection, Implementation and Review, 8th Edition, McGraw-Hill, New Delhi.

References:

1. Chitkara, K.K, (2014), Construction Project Management, 3rd Edition, McGraw-Hill Publishing Company, New Delhi.
2. Alison Dykstra (2011), Construction Project Management: A Complete Introduction, Kirshner Publishing, San Francisco, USA
3. Jimmie W. Hinze, (2013), Construction Planning and Scheduling, 4th Edition, Pearson, NewDelhi.

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Subject	CONTRACT AND ADMINISTRATION PLANNING				
SPECIALIZED MINOR		L	T	P	C
Regulation year	R - 20	3	0	0	3

Course Objectives:

1. To make students who take this course be able to design sound contracts by training to interpret legal provisions and effectively administer and fulfill the requirements of a contract.
2. To be able to effectively administer contract and identify tools available for contract preparation and administration, to identify good practice important stages of contract and wordings in contract.
3. Understand jurisprudence to effectively administer contracts and a construction organization**,** to intepret the laws like Labour Laws, Tax laws and requirements and guidelines of other national and international legal regulatory bodies.

Course Outcome:

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

1. Explain the various types of construction contracts and their legal aspects.
2. Appreciate the merits and demerits of a contract form and choose the most appropriate form ensuring sufficient safeguards are agreed upon to protect the interest of the party represented from Torts, LD etc.
3. Identify and develop the stages of a tender; decide the work flow and be able to define requirements of each relevant stage.
4. Prevent failure of a contract; Understand legal recourse when a contract fails irreconcilably
5. Relate legal aspects of a contract, gain knowledge in tax laws and understand labour regulations to construction industry

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SYLLABUS

UNIT – I

Introduction: Definition of Contract Legal issues in contract – Standard forms of contracts- General and special conditions of contracts- Contract pricing by the client, project management consultants and the contractor, Contract correspondence and contract closure.

Construction Contracts: Types of contracts, Documents forming a contract, General conditions of Indian contracts – International contracts - Contract administration, Law of Torts - Interpretation of contract in case of inconsistency including case study.

UNIT – II

Tenders: Prequalification – Bidding – Accepting – Evaluation of Tender from Technical, Contractual and Commercial Points of View – Contract Formation and Interpretation – Potential Contractual Problems - World Bank Procedures and Guidelines – Tamilnadu Transparency in Tenders Act.

UNIT – III

Arbitration: Comparison of Actions and Laws – Agreements –Appointment of Arbitrators – Conditions of Arbitration – Arbitration Tribunals - Powers and Duties of Arbitrator – Enforcement of Award – Arbitration and Conciliation Act 1996 - Arbitration case study.

Legal Requirements: Insurance and Bonding – Types of Bonds - Laws Governing Sale, Purchase and Use of Urban and Rural Land – Land Revenue Codes- Claims and disputes - Dispute resolution techniques.

UNIT – IV

Tax Laws: Income Tax, Sales Tax, Excise and Custom Duties and their Influence on Construction Costs – Legal Requirements for Planning – Property Law – Agency Law – Local Government Laws for Approval – Statutory Regulations.

UNIT – V

Labour Regulations: Social Security – Welfare Legislation – Laws relating to Wages, Bonus and Industrial Disputes – Workmen's Compensation Act 1923 – Indian Factory Act 1948 – Tamil Nadu Factory Rules 1950 – Child Labour (Prohibition and Regulation) Act, 1986 - Other Labour Laws and Regulations.

Text books:

1. Jimmie Hinze, (2013), Construction Contracts, 3rd Edition, McGraw Hill, New Delhi**.**
2. Sharma M.R., (2013), Fundamentals of Construction Planning & Management S.K. Kataria & Sons, New Delhi.

References:

1. Joseph T. Bockrath and Fredric L. Plotnick, (2013), Contracts and the Legal Environment: for Engineers and Architects, 7th Edition, McGraw Hill, New Delhi.
2. Markanda P.C., Naresh Markandaand Rajesh Markanda, (2016), Law Relating to Arbitration and Conciliation, 9th Edition, Lexis Nexis, New York.
3. Martin Brook (2016), Estimating and Tendering for Construction Work, 5th Edition, Routledge, Taylor & Francis.
4. Govt of India, Central Public Works Department, CPWD Works Manual 2014.

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Subject	QUALITY CONTROL AND SAFETY				
SPECIALIZED MINOR		L	T	P	C
Regulation year	R - 20	3	0	0	3

Course Objectives:

1. To study the concepts of quality assurance and control techniques in construction.
2. To understand the techniques and concepts of Statistical Quality Control Methods.
3. To familiarize with clauses for quality management in construction Industry and to study the various construction accidents and cost of construction injuries.

Course Outcome:

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

1. Explain the importance of quality and quality management methods in construction.
2. Construct the appropriate quality control charts and discuss the role of such charts in monitoring a process.
3. Develop an appropriate quality assurance plan to assess the ability of the service to meet its required national and international quality standards.
4. Apply the concepts of quality assurance and control techniques in construction.
5. Identify the causes, investigations and prevention of accidents in the construction jobsite.

SYLLABUS

UNIT – I

Construction Quality: Introduction to quality - Importance - Types – Inspection - Control and enforcement-Quality Management Systems - Responsibilities and authorities in Quality assurance -Architects, Engineers, Contractors and Consultants.

Quality Standards and Statistical Methods: Planning and control of quality - Tools and techniques for quality management - Inspection of materials and machinery - Quality audits-Statistical quality control - Tools ,Control charts - Acceptance sampling, Specification and tolerances.

UNIT – II

Quality Management: Quality policy - Objectives and methods -Consumer satisfaction-Ergonomics-Time of Completion-Taguchi's concept of quality- Quality standards/codes in design and construction (ISO: 9000) - Quality System Documents – Quality related training – Implementing a Quality system – Third party Certification.

Quality Assurance and Control: Objectives-Regularity agent-Owner, Design, Contract and Construction Oriented Objectives, Methods-Techniques and Needs Of QA/QC-Different Aspects of Quality-Appraisals, Factors Influencing Construction Quality-Critical, Major Failure Aspects and Analysis.

UNIT – III

Construction Accidents: Injury and Accidents- Causes, Investigations and Prevention of Accidents, Hazards – Types, Nature, Causes and Control Measures - Identifications and Control Techniques - Cost of Construction Injuries-Legal Implications - Site management with regard to safety –Safety training and implementation - Construction safety and health manual.

UNIT – IV

Safety Policy: Need- Safety provisions -Factory Act-Laws related to the Industrial Safety-Measurement of Safety Performance, Safety Audit, Problem Areas in Construction Safety-Elements of an Effective Safety Programme-Job site Safety assessment- Safety Meetings-Safety Incentives.

UNIT – V

Safety Organization: Safety Policy, Safety Record Keeping, Safety Culture-Safe Workers-Safety and First Line Supervisors- Middle Managers-Top Management Practices, Company Activities and Safety-Sub contractual obligation, Project Coordination and Safety Procedures.

Text books:

1. Brian Thorpe and Peter Sumner(2016), Quality Assurance in Construction**.**
2. Routledge Steven Mccabe, (2016), Quality Improvement Techniques in Construction: Principles and Methods, Routledge

References:

1. Abdul Razzak Rumane, (2017), Quality Management in Construction Projects, CRC Press
2. Tim Howarthand David Greenwood, (2017), Construction Quality Management: Principles and Practice, Routledge.

3. Greg Hutchins, (2010), ISO 9000: A Comprehensive Guide to Registration, Audit Guidelines and Successful Certification Hardcover, Wight (Oliver) Publications Inc., U.S.

4. Chung H.W., (2011), Understanding Quality Assurance in Construction: A Practical Guide to ISO 9000 for Contractors , Routledge.

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Subject	CONSTRUCTION PRACTICES AND EQUIPMENT				
SPECIALIZED MINOR		L	T	P	C
Regulation year	R – 20	3	0	0	3

Course Objectives:

1. To understand the various techniques to be implemented in substructure construction and to know the launching of girders, material handling and erection of components in super structure construction.
2. To study the various types of roads; its construction procedure and equipment employed in road construction and to attain the knowledge in harbour, dam, river work and pipeline construction.
3. To know the various types of equipment and its usage in different types of constructions and to obtain the knowledge of equipment management, cost control in construction.

Course Outcome:

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

1. Identify the suitable techniques to construct the structure based on site condition.
2. Prepare the work schedule for any type of super structure construction.
3. Identify the techniques to implement in construction of Embankment, Retaining wall, breast wall in hill road.
4. Identify the suitable method and equipment to construct a Road, Dams, Harbour, River work and pipelines.
5. Prepare a suitable plan for erection of new plants like Batching and mixing plant, Ready mix concrete plant at site.

SYLLABUS

UNIT – I

Sub Structure Construction: Techniques of Box jacking – Pipe Jacking -under water construction of diaphragm walls and basement-Tunneling techniques – Piling techniques - Dewatering and stand by Plant equipment for underground open excavation.

Superstructure Construction: Launching girders, bridge decks, offshore platforms – Material handling - erecting lightweight components on tall structures - Erection of articulated structures - Fabrication and erection of steel trusses and frames.

UNIT – II

Highway Construction Practice: Embankment Construction - Ground improvement techniques, Retaining and Breast walls on hill road. Bituminous Constructions- Concrete road construction: Test - Construction equipments - Method of construction of joints in concrete pavements - IRC specifications.

UNIT – III

Dams and Harbour Construction Practice: Construction Methods and Equipment for Dams, Harbours, River works and Pipelines.

Earthwork Equipment: Fundamentals of Earthwork Operations - Earth Moving operations- Types of Earthwork Equipment - Tractors, Motor Graders, Scrapers, Front end Loaders, Earth Movers – capacity calculations.

UNIT – IV

Forklifts and Screening Equipment: Forklifts and related equipment - Portable Material Bins - Conveyors - equipment used in demolition – Chain Pulley Blocks. Crushers – Feeders - Screening Equipment - Batching and Mixing Equipment – Hauling equipment - Pouring and Pumping Equipment – Ready mixed concrete carriers.

UNIT – V

Equipment Management: Factors affecting selection of equipment and methods –Planning - Equipment Management in Projects - Maintenance Management – Replacement - Cost Control of Equipment – Depreciation Analysis, Methods of calculation of depreciation- Safety Management.

Text books:

1. Punmia B. C., Ashok Kumar Jain, Arun Kumar Jain, (2017), Building Construction, 11th Edition, Lakshmi Publications, New Delhi.
2. Robert L. Peurifoy, Clifford J. Schexnayder, AviadShapira (2010), Construction Planning, Equipment and Methods, Indian Edition,Mc-Graw Hill-Education, New Delhi.

References:

1. Kumar NeerajJha, (2015), Construction Project Management, 2nd Edition, Pearson, New Delhi.
2. Varghese P.C., (2012), Foundation Engineering, PHI Learning Private Limited, New Delhi.

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Subject	FORMWORK FOR CONCRETE STRUCTURES				
SPECIALIZED MINOR		L	T	P	C
Regulation year	R – 20	3	0	0	3

Course Objectives:

1. To develop the conceptual understanding of design of form work.
2. To develop the conceptual understanding of construction of form work.
3. To develop the conceptual understanding of erection of formwork.
4. To impart the knowledge about different types of form work used for special structures.

Course Outcome:

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

1. Carryout the detailed planning of form works used for construction of different structures, identify the suitable Materials for formwork and calculate the various loads on the formwork and its accessories.
2. Design the form works for construction of different structures; execute the different techniques used for construction and erection of form work.
3. Analyse the form work for shell type structures, carryout the detailed planning of Slip Forms and Scaffolds.

SYLLABUS

UNIT – I

Planning for Form Work: Introduction –Types of Form work- Forms for foundations, columns, beams walls etc., General objectives of formwork building - Detailed planning - Calculation of labour constants Scaffold frames - Framed panel formwork.

Materials for Formwork: Lumber - Types - Finish - Sheathing boards working stresses - Repetitive member stress - Plywood - Types and grades - Jointing Boarding - Textured surfaces and strength - Reconstituted wood - Steel – Aluminum.

UNIT – II

Formwork Accessories & Pressures: Formwork Accessories -Hardware and fasteners - Nails in Plywood - Allowable withdrawal load and lateral load. Pressures on formwork - Examples - Vertical loads for design of slab forms - Uplift on shores - Laterals loads on slabs and walls.

Design of Forms and Shores: Design Principles - Allowable stresses - Design of Wall forms - Slab forms - Beam forms - Column forms - Design Tables for Wall formwork - Slab Formwork - Column Formwork - Slab props - Stacking Towers - Free standing and restrained - Rosett Shoring - Shoring Tower - Heavy Duty props.

UNIT – III

Building and Erecting the Form Work: Carpentry Shop and job mill - Forms for Footings - Slab form systems - Sky deck and Multiflex - Customized slab table - Standard Table module forms - Swivel head and uniportal head - Assembly sequence - Cycling with lifting fork - Moving with table trolley and table prop. Various causes of failures - ACI - Design deficiencies - Permitted and gradual irregularities.

UNIT – IV

Forms for Domes and Tunnels: Hemispherical, Parabolic, Translational shells - Typical barrel vaults - Folded plate roof details - Forms for Thin Shell roof slabs design considerations - Strength requirements -Tunnel forming components - Curb forms invert forms - Arch forms - Concrete placement methods - Cut and cover construction - Bulk head method - Pressures on tunnels - Continuous Advancing Slope method - Form construction - Shafts.

UNIT – V

Slip Forms and Scaffolds: Slip Forms - Principles -Types - advantages - Functions of various components - Planning - Desirable characteristics of concrete - Common problems faced - Safety in slip forms special structures built with slip form Technique - Types of scaffolds - Putlog and independent scaffold - Single pole scaffolds - Truss suspended - Gantry and system scaffolds.

Text books:

1. Oberlender G.D and Peurifoy R. L. (2010), Formwork of Concrete Structures, 4th Edition McGraw Hill Education, New Delhi.
2. Christopher Souder, (2014), Temporary Structure Design, Wiley Publications, London.

References:

1. Kumar. NeerajJha, (2017), Formwork for Concrete Structures, McGraw Hill Education, New Delhi.
2. Leonard Koel , (2015), Concrete Formwork, American Technical Publisher, USA.
3. ACI 347R-14: Guide to Formwork for Concrete, ACI Committee 347, American Concrete Institute.

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Subject	CONSTRUCTION TECHNIQUES OF STEEL AND CONCRETE COMPOSITE STRUCTURES				
SPECIALIZED MINOR		L	T	P	C
Regulation year	R – 20	3	0	0	3

Course Objectives:

1. To introduce the concept of steel-concrete composite construction and their applications in engineering.
2. To understand the various types of connections in steel & steel-concrete composite construction.
3. To learn the methodology, construction sequence & techniques of framed industrial structures.

Course Outcome:

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

1. Envisage the behaviour of steel-concrete composite members and perform limit state design for steel structures.
2. Identify suitable connections in steel structures and provide connection details.
3. Prepare and propose suitable construction sequence.
4. Techniques for framed industrial structures.
5. Identify and propose suitable materials for sandwich constructions.

SYLLABUS

UNIT – I

Introduction: Introduction to Steel - Concrete Composite Construction - Theory of Composite Structures - Introduction to Steel - Concrete - Steel - Sandwitch Construction - Behaviour of composite beams and columns

UNIT – II

Steel Structures: Types of steel structures, grades of structural steel, various rolled steel sections, relevant IS specifications such as IS:800-2007, IS:808-1989, IS:875 part I to III, SP: 6(1), SP: 6(6), SP38. IS:4000- 1992, codes for welded connections , Philosophy of limit state design for strength and serviceability, partial safety factor for load and resistance, design load combinations.

UNIT – III

Connections: Bearing type joints - Unstiffened and stiffened seat connections - Moment resisting connection of brackets-Bolted and welded-semi-rigid connections - Types of weldings – Types of rivets.

Industrial Buildings: Industrial buildings- construction techniques of braced and unbraced - Gable frames with gantryRigid industrial frames – Fixing and assembly of steel structures.

UNIT – IV

Special Structures: Introduction to steel-concrete compsite structures - construction techniques for composite structures – composite beam – column construction - shear connectors – behaviour – flextural stress – longitudinal shear transfer – transfer shear.

UNIT – V

Sandwich Constructions: Basic design concept of sandwich construction – Materials used for sandwhich construction – Failure modes.

Fabrication and assembly: Various open and closed mould process – fibers types – resins types – properties and application – composite structures – maintenance and repair.

Text books:

1. Johnson R.P. (2012), Composite Structures of Steel and Concrete: Beams, Slabsm Columns and Frames for Buildings, Wiley India Pvt Ltd.
2. Brian Uy and Zhong Tao (2018), Behaviour and Design of Composite Steel and Concrete Building Structures ,CRC Press.

References:

1. Panchal D R, (2014), Composite Steel-Concrete Structures, Scholars Press.

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Subject	CONSTRUCTION TECHNIQUES OF DEEP FOUNDATIONS				
SPECIALIZED MINOR		L	T	P	C
Regulation year	R - 20	3	0	0	3

Course Objectives:

1. To understand the various types of deep foundations and to know the various methods and techniques involved in construction of deep foundations.
2. To know the various equipment involved in construction of deep foundation and to understand the management and safety requirements in construction of deep foundations.
3. To know the concept of sheet piles, coffer dams and reinforced earth walls.

Course Outcome:

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

1. Understand the various types of deep foundations.
2. Know the various methods and techniques involved in construction of deep foundations.
3. Know the various equipment involved in construction of deep foundation.
4. Understand the management and safety requirements in construction of deep foundations.
5. The concept of sheet piles, coffer dams and reinforced earth walls.

SYLLABUS

UNIT – I

Introduction to deep foundations: Introduction- Preliminary investigations, subsurface exploration, data interpretation and estimation of various sub-soil properties; Types of deep foundations; Requirements for deep foundations; Codal provisions on safety requirements for deep foundations.

Bored piles: Classification of bored piles; Construction methods and construction sequences of bored piles; Equipment's used for boring, drilling and concreting; Piling supervision and quality assurance; Design considerations and pile capacity.

UNIT – II

Driven piles: Classification of driven piles; Selection of type of piles and method of installation; Pile driving equipment's; Construction and quality assurance of driven piles; Advantages and disadvantages of driven piles; Pile damages and pile integrity test; Design considerations and pile capacity.

UNIT – III

Well Foundations: Types of wells or caissons; Different shapes of well; Drilled shafts and caissons; Methods and construction sequences; Design procedure; Advantages and disadvantages of well foundation.

Diaphragm wall: Deep excavations and protection systems; Applications of diaphragm wall; Diaphragm wall construction methods; Design procedure; Advantages and disadvantages.

UNIT – IV

Sheet piles and Coffer Dams: Sheeting and bracing systems in shallow and deep open cuts in different soil types –Cantilever sheet piles, Anchored sheet piles; Construction methods and sequences; Design procedure; Merits and demerits. Types of Coffer dams; Coffer dams components and construction sequences; design procedure for cellular coffer dam; merits and demerits.

UNIT – V

Reinforced Earth Walls: Introduction; Advantages of RE walls; Behaviour of RE walls; Materials for reinforced earth structures; Soil-reinforcement interaction; Internal and external stability conditions; Design criteria; Field applications of RE walls.

Text books:

1. Bowles, J. E., (2011), Foundation Analysis and Design, 7th Edition, McGraw Hill Book Co., New York.
2. Das. B. M., (2010), Principles of Foundation Engineering, CL Engineering.

References:

1. Huang A.B., Yu H.S, (2018) Foundation Engineering Analysis and Design, CRC Press, Taylor & Francis group.
2. Fang. H.Y.,(2012), Foundation Engineering Handbook, Springer Science and Business Media.

3. Varghese. P. C., (2009), Design of Reinforced Concrete Foundations, Prentice Hall of India, New Delhi.
4. Murthy. V. N. S., (2009), Soil Mechanics and Foundation Engineering – CBS Publications, Delhi.
5. Tomlinson M and Woodward J. (2008). Pile Design and Construction Practice" 5th Edition. Taylor and Francis.
6. K. R. Arora., (2011) Soil Mechanics and Foundation Engineering, Standard publishers**.**
7. BIS 2911 (Part 1/Sec 1, Sec 2, Sec 3 and Sec 4) (2010) Design and construction of pile foundations-code of practice (Driven cast in-situ concrete piles), Bureau of Indian Standards, New Delhi.

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Subject	STRUCTURAL DYNAMICS				
SPECIALIZED MINOR		L	T	P	C
Regulation year	R - 20	3	0	0	3

Course Objectives:

1. To know various dynamic forces acting on a building and their response.
2. To obtain knowledge on modes of failure and remedial solutions.
3. To study the analysis procedure for calculating the response of structures, to understand the linear and no-linear behaviour of structures.

Course Outcome:

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

1. Differentiate static and dynamic behavior of structures and their physical properties.
2. Identify and model a single degree of freedom system subjected to dynamic load.
3. Evaluate the response of single storied building subjected to dynamic load.
4. Identify and model a multi degree of freedom system subjected to dynamic load.
5. Evaluate the response of multi-storied building subjected to dynamic load.

SYLLABUS

UNIT – I

Introduction: History of vibration - Dynamic analysis and their importance to structural engineering problems - Degrees of freedom - D'Alembert's principle - Lagrange's equation - Simple harmonic motion.

UNIT – II

Single Degree of Freedom: Mathematical model for SDOF systems - Free vibration - Undamped - Damped - Critical damping - Measurement of damping - Vibration measuring instruments.

Response of SDOF Systems: Response of SDOF system to Harmonic Loading, Periodic loading and Impulse Loading - Transmissibility - Fourier series - Duhamel's integral - Numerical integration.

UNIT – III

Multi Degree of Freedom System: Equation of motion - Free vibration - Undamped - Damped - Evaluation of structural property matrices - Mode shape - Orthogonality relationship.

Response of MDOF Systems: Rayleigh's method - Rayleigh-Ritz method - Stodola's method - Stiffness method – Mode superposition method.

UNIT – IV

Continuous Systems: Differential equation of motion - Transverse vibration - Axial vibration - Natural frequency and mode shape of simple beams with different end conditions – Variable cross section beams - Orthogonality relationship.

UNIT – V

Non-linear Numerical Techniques: Wilson Theta method - Newmark Beta method –Runge-Kutta method.

Text books:

1. Mario Paz and William Leigh (2010), Structural Dynamics - Theory and Computation, Springer.

References:

1. Clough and Penzien (2015), Dynamics of Structures, CBS Publishers and Distributors, New Delhi.
2. Chopra. A. K. (2011), Dynamics of Structures - Theory and Applications to Earthquake Engineering, 4th edition, Prentice Hall, London.
3. Roy R.Craig, Jr. Andrew J. Kurdila (2011), Fundamentals of Structural Dynamics, John Wiley and Sons, London.

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Subject	FINITE ELEMENT ANALYSIS				
SPECIALIZED MINOR		L	T	P	C
Regulation year	R - 20	3	0	0	3

Course Objectives:

1. To have a detailed knowledge and understanding of the fundamental concepts of finite element methods.
2. To introduce basic aspects of finite element technology, including domain discretization, polynomial interpolation, application of boundary conditions, assembly of global arrays, and solution of the resulting algebraic systems.
3. To develop proficiency in the application of the finite element methods (modeling, analysis, and interpretation of results) to realistic engineering problems.

Course Outcome:

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

1. Understand the fundamental theory of finite element methods and develop the ability to generate the governing FE equations for systems governed by partial differential equation.
2. Demonstrate the role and significance of shape functions in finite element formulations and use linear, quadratic, and cubic shape functions for interpolation.
3. Acquire knowledge in direct and formal (basic energy and weighted residual) methods for deriving finite element equations.
4. Have insights into the use of the basic finite elements for structural applications using truss, beam, frame, and plane elements.
5. Identify appropriate space (planar (plane stress or strain), axisymmetric, or spatial), idealization (type of element), and modeling techniques, understand the professional level finite element software to solve the engineering problems.

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SYLLABUS

UNIT – I

Introduction: Background – General description of the method – Analysis procedure - Principles of elasticity Stress and strain vectors – Strain displacement equations – Linear constitutive equations – Overall stiffness matrix – Overall load matrix.

UNIT – II

Theory of Finite Element: Concept of an element – Various element shapes – Displacement models – Approximation displacements by polynomials – Convergence requirements – Shape functions – Element strains and stresses – Analysis of beams.

UNIT – III

Natural Coordinates: Area and volume coordinates- Discretisation of a body or structure – Minimization of band width – Construction of stiffness matrix and loads for the assemblage – Boundary conditions – Mesh generation.

UNIT – IV

Two and Three Dimensional Problems: Analysis of plane truss, space truss, plane frame and grid- Axisymmetric elements.

Plane Stress and Plane Strain Conditions: CST, LST & QST elements - solutions of problems.

UNIT – V

Isoparametric Formulation: Iso parametric Bar element - Plane bilinear isoparametric element - Plane stress element - Quadratic plane elements - Application of Gauss Quadrature formulation –Lagrange's and serendipity elements.

Introduction to 3-D Elements: Three dimensional elasticity-Governing differential equations-Higher order Isoparametric solid elements.

Text books:

1. Krishnamoorthy, C.S, "Finite Element Analysis ; Theory and programming", Tata McGraw Hill Publishing Co. Ltd., (2017)

References:

1. Cook R.D., Malkas D.S. & Plesha M.E, "Concepts and applications of Finite Element Analysis", John Wiley & Sons., (2007)
2. Reddy,J, "An Introduction to Finite Element Methods", McGraw Hill Co., (2013).
3. Zeinkeiwich O.C.,R.L.Tayler, "The Finite Element Method for Solid and Structural Mechanics", Butterworth-Heinemann, (2013).

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Subject	STABILITY OF STRUCTURES				
SPECIALIZED MINOR		L	T	P	C
Regulation year	R - 20	3	0	0	3

Course Objectives:

1. To understand the difference between stability and instability.
2. To evaluate and analyse the structural stability of column and frames.
3. To understand deformation characteristics of torsional buckling and to identify the differential equation of buckling of plates and shells.

Course Outcome:

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

1. Understand the difference between stability and instability.
2. Evaluate the structural stability of columns.
3. Analyse the stability of beam column and frames.
4. Understand deformation characteristics of torsional buckling.
5. Identify the differential equation of buckling of plates and shells.

SYLLABUS

UNIT – I

Introduction: Static equilibrium – Governing equation for columns – Analysis for various boundary conditions.

UNIT – II

Analysis of Column: Eccentrically loaded column and Initial Imperfect column -Numerical Problems.

UNIT – III

Beam column: Theory of Beam column – Stability analysis of beam column with different types of loads – Failure of beam columns.

UNIT – IV

Analysis and Stability of Frames: Various Boundary Conditions – Differential equations – Slope Deflection method.

Torsional Buckling: Torsional load-Deformation characteristics of structural members- strain energy of torsion – Torsional and flexural torsional buckling of columns.

UNIT – V

Buckling of Plates: Differential Equation of plate buckling –linear theory – critical load of a plate uniformly compressed in one direction.

Buckling of Shells: Differential equation – Analysis – Application.

Text books:

1. Iyengar. N.G.R., (2007), Elastic Stability of Structural Elements, McMillan, New Delhi.

References:

1. Galambos. T.V., Surovek A. E (2008), Structural Stability of Steel: Concepts and Applications for Structural Engineers, Wiley, London.

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Subject	THEORY OF ELASTICITY				
SPECIALIZED MINOR		L	T	P	C
Regulation year	R - 20	3	0	0	3

Course Objectives:

1. To impart knowledge on the basic concepts of theory of elasticity.
2. Solve the Structural Engineering problems.
3. Solve the thermal stresses in plain stress and plane stain conditions.

Course Outcome:

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

1. Understand the Basic field equations of linear elastic solids, force, stress, strain and equilibrium in solids.
2. Analyse the 2D structural elements, beams, cylinders.
3. Use analytical techniques to predict deformation, internal force and failure of simple solids and structural components.
4. Analyse the axisymmetric structural elements and structural members subjected to torsion.
5. Determine the thermal stresses in plain stress and plane stain conditions.

SYLLABUS

UNIT – I

Introduction: Elasticity – notation for forces and stress – components of stresses – components of strain – Hooks law. Plane stress and plane strain analysis – differential equations of equilibrium – boundary conditions – Strain Displacement Relations – compatibility equations – stress function.

UNIT – II

Two dimensional problems in rectangular coordinates: Solution by polynomials – Saint-Venants principle – determination of displacements – bending of simple beams – Simple Supported and Cantilever Beam.

UNIT – III

Two dimensional problems in polar coordinates: Stress distribution symmetrical about an axis – pure bending of curved bars – strain components in polar coordinates – displacements for symmetrical stress distributions Edge Dislocation – general solution of two-dimensional problem in polar coordinates – application to Plates with Circular Holes – Rotating Disk. Bending of Prismatic Bars: Stress function – bending of cantilever – circular cross section – elliptical cross section – rectangular cross section.

UNIT – IV

Analysis of stress and strain in three dimensions: Principal stress – stress ellipsoid – director surface – determination of principal stresses Stress Invariants – max shear stresses Stress Tensor – Strain Tensor- Homogeneous deformation – principal axes of strain-rotation. General Theorems:Differential equations of equilibrium – conditions of compatibility – determination of displacement – equations of equilibrium in terms of displacements – principle of super position – uniqueness of solution – the reciprocal theorem Strain Energy.

UNIT – V

Torsion of Circular Shafts: Torsion of Straight Prismatic Bars– Saint Venant's Method – torsion of prismatic bars – bars with elliptical cross sections – membrane analogy – torsion of a bar of narrow rectangular bars – solution of torsional problems by energy method – torsion of shafts, tubes , bars etc. – Torsion of Rolled Profile Sections.

Text books:

1. Theory of Elasticity by Timoshenko, Mc-Graw hill Publications**.**
2. Advanced Mechanics of Materials by Arthur P. Boresi, John Willey publishers**.**

References:

1. Theory of Elasticity by Y.C. Fung, Dover publications, New York.
2. Theory of Elasticity by Sadhu singh, Khanna Publishers.
3. Advanced Mechanics of solids by L.S.Srinath, Tata Mc-Graw Hill.

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Subject	TRANSPORTATION PLANNING				
SPECIALIZED MINOR		L	T	P	C
Regulation year	R - 20	3	0	0	3

Course Objectives:

1. Understand the dynamics of human settlements, both past and present, through various theories and approaches
2. Understand the settlements as an expression of culture, influenced by climate and geographical location.
3. Gain the facility of utilizing the state of the art techniques and models in the field.

Course Outcome:

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

1. To understand the dynamics of human settlements, both past and present, through various theories and approaches.
2. To understand settlements as an expression of culture, influenced by climate and geographical location.
3. To understand various theories, concepts, models and approaches of planning that have influenced/directed/guided the planning process.
4. To understand the planning process, and various types of plans, especially in India.

SYLLABUS

UNIT – I

History of Settlements: City as a cultural construct, ancient to modern- an expression of religion and rituals, social and economic structure, city as a political statement, concept of the "Ideal city" with examples from India and the other parts of the world. Evolution of settlements – origin, influence, livelihood, culture, growth/decline; physical structure – form, organization, space, scale; elements of the city.

UNIT – II

Planning Process: Definition and objectives of planning, concepts and approaches, governing factors – vision, strategy, goal, objectives, scope and limitation in the Indian context. Types of

plans and planning processes – Structure plans, Action plans, strategic plans; Autocratic planning, Democratic planning, Technocratic planning, Liberal planning, Socialist planning.

UNIT – III

Planning and development theories: Concentric zone theory, sector theory, multiple nuclei theory, land use and land value theory, other latest theories from around the world. Growth Pole theory, Christaller's Central Place theory, Weber's Theory of Locations, Core-periphery theory, Land Use and Land Value Theory of William Alonso, Spread and Back wash theory – relevance of these in the Indian context.

UNIT – IV

Various concepts of planning: Garden city concept, green belt concept, Neighbourhood concept, Generatic and Parasitic city. Various models and approaches – Advocacy and Pluralism in planning, Action planning, Mixed planning, Systems approach to planning, Rationalistic and Incremental approach, Mixed Scanning and Middle Range planning, Equity planning.

UNIT – V

Contribution of individuals to city planning: Contribution of individuals to city planning and understanding of the city – Lewis Mumford, Patrick Geddes, Peter Hall, Kevin Lynch, Edward Bacon, Camillo sitte, Le Corbusier, Frank Lloyd Wright.

Text books:

1. Morris. A.E.J., 1979, History of Urban Form Before the Industrial Revolution, George Godwin Limited, London.
2. Mumford, L., The City in History.

References:

1. Gallion. A., Eisner. S., 1998 (fifth edition), The Urban Pattern-City Planning and Design CBS Publishers and Distributors, New Delhi, in arrangement with Van Nostrand Reinhold Company, USA.
2. Le Gates. R. T., Stout. F., (ed), The City Reader, 2011 (fifth edition), Routledge, London.

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Subject	INTELLIGENT TRANSPORTATION SYSTEMS				
SPECIALIZED MINOR		L	T	P	C
Regulation year	R - 20	3	0	0	3

Course Objectives:

1. To develop an understanding of system engineering processes.
2. To describe the concepts of system architecture and their evolution.
3. Understand the capability of key technologies.

Course Outcome:

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

1. Differentiate different ITS user services.
2. Select appropriate ITS technology depending upon site specific conditions.
3. Design and implement ITS components.
4. Understand impact of technology on different modes and movement.
5. Understand how to evaluate technologies, applications and services.

SYLLABUS

UNIT – I

Introduction to Intelligent Transportation Systems (ITS): Definition of ITS and Identification of ITS Objectives, Historical Background, Benefits of ITS - ITS Data collection techniques – Detectors, Automatic Vehicle Location (AVL), Automatic Vehicle Identification (AVI), Geographic Information Systems (GIS), video data collection.

UNIT – II

Telecommunications in ITS: Importance of telecommunications in the ITS system, Information Management, Traffic Management Centres (TMC). Vehicle – Road side communication – Vehicle Positioning System.

UNIT – III

ITS functional areas: Advanced Traffic Management Systems (ATMS), Advanced Traveler Information Systems (ATIS), Commercial Vehicle Operations (CVO), Advanced Vehicle Control Systems (AVCS), Advanced Public Transportation Systems (APTS), Advanced Rural Transportation Systems (ARTS).

UNIT – IV

ITS User Needs and Services: Travel and Traffic management, Public Transportation Management, Electronic Payment, Commercial Vehicle Operations, Emergency Management, Advanced Vehicle safety systems, Information Management.

UNIT – V

Automated Highway Systems: Vehicles in Platoons – Integration of Automated Highway Systems. ITS Programs in the World – Overview of ITS implementations in developed countries, ITS in developing countries.

Text books:

1. ITS Hand Book 2000: Recommendations for World Road Association (PIARC) by Kan Paul Chen, John Miles.

References:

1. Sussman, J. M., Perspective on ITS, Artech House Publishers, 2005.
2. National ITS Architecture Documentation, US Department of Transportation, 2007 (CD-ROM).

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Subject	THEORY OF TRAFFIC FLOW				
SPECIALIZED MINOR		L	T	P	C
Regulation year	R - 20	3	0	0	3

Course Objectives:

1. Provide students with a working knowledge of driver behavior, traffic characteristics, traffic operations, highway capacity and level of service.
2. And operational considerations for design of traffic facilities.
3. Students should be prepared to work and to take other advanced courses in the area of traffic engineering.

Course Outcome:

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

1. Describe the main characteristics of traffic flow.
2. Represent traffic phenomena using different methods and tools.
3. Recognise how traffic congestion starts and propagate.
4. Select and apply appropriate methods and techniques for analysing traffic-related problems.
5. Interpret and elaborate different type of traffic data and follow scientific literature in traffic flow theory.

SYLLABUS

UNIT – I

Traffic stream parameters: Fundamental diagram of volume-speed-density surface. Discrete and continuous probability distributions. Merging manoeuvres - critical gaps and their distribution.

UNIT – II

Macroscopic models: Heat flow and fluid flow analogies - Shock waves and bottleneck control approach.

UNIT – III

Microscopic models: Application of queuing theory - regular, random and Erlang arrival and service time distributions - Waiting time in single channel queues and extension to multiple channels.

UNIT – IV

Linear and non-linear car following models: Determination of car following variables - Acceleration noise.

UNIT – V

Geographical Information System: Global Positioning System – Intelligent Transportation Systems - Area Traffic Control – Automatic Toll Collection – Smart Cards – Collision Detection System.

Text books:

1. Drew, D.R., Traffic Flow Theory and Control, McGraw Hill., 1978.
2. TRB, Traffic Flow Theory - A Monograph, SR165, 1975.

References:

1. Burrough P.A. and Rachel A. McDonell, Principles of Geographical Information Systems, Oxford Publication, 2004.

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Subject	PAVEMENT MATERIALS				
SPECIALIZED MINOR		L	T	P	C
Regulation year	R - 20	3	0	0	3

Course Objectives:

1. To impart practical and latest knowledge on different paving materials along with their characterization**.**
2. To design different types of paving mixes**.**
3. Knowledge of various Pavement Materials.

Course Outcome:

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

1. To gain Knowledge of various Pavement Materials.
2. Learning of Conventional and Advanced Charactrisation of Pavement Materials.
3. Finding practical solution to Mix design of Pavement Materials.
4. To design different types of paving mixes and subgrade soil.
5. To gain Knowledge of various Bituminous Mixes.

SYLLABUS

UNIT – I

Subgrade soil: Soil composition and structure - Soil classification for engineering purposes - Origin, Classification, requirements, properties and tests on road aggregates.

UNIT – II

Origin, preparation, properties and tests: Constitution of bituminous road binders, requirements - Bituminous Emulsions and Cutbacks: Preparation, characteristics, uses and tests.

UNIT – III

Bituminous Mixes: Mechanical properties - Resilient modulus, dynamic modulus and fatigue characteristics of bituminous mixes.

UNIT – IV

Weathering and Durability of Bituminous Materials and Mixes: Performance based Bitumen Specifications - Superpave mix design method.

UNIT – V

Cement Concrete for Pavement Construction: Requirements, design of mix for CC pavement, joint filler and sealer materials.

Text books:

1. RRL, DSIR, Bituminous Materials in Road Construction, HMSO Publication, 1955.

References:

1. IS and IRC Publications on relevant topic.