COURSE STRUCTURE

For

B.Tech.

Civil Engineering

(*for 2023 Admitted batch only)*

PRAGATI ENGINEERING COLLEGE

(An Autonomous Institution)
ADB Road, Surampalem, Kakinada District, A.P.-533 437
(Approved by AICTE, New Delhi & Permanently Affiliated to JNTUK, Kakinada)
(Recognized by UGC under sections 2 (f) and 12 (b) of UGC act, 1956)

Pragati Engineering College (Autonomous)

R23

Department of Civil Engineering

COURSE STRUCTURE

INDUCTION PROGRAMME

S.No.	Course Name	Category	L	T	P	Credits
1	Physical Activities -- Sports, Yoga and Meditation, Plantation	MC	0	0	6	0
2	Career Counselling	MC	2	0	2	0
3	Orientation to all branches -- career options, tools, etc.	MC	3	0	0	0
4	Orientation on admitted Branch -- corresponding labs, tools and platforms	EC	2	0	3	0
5	Proficiency Modules & Productivity Tools	ES	2	1	2	0
6	Assessment on basic aptitude and mathematical skills	MC	2	0	3	0
7	Remedial Training in Foundation Courses	MC	2	1	2	0
8	Human Values & Professional Ethics	MC	3	0	0	0
9	Communication Skills -- focus on Listening, Speaking, Reading, Writing skills	BS	2	1	2	0
10	Concepts of Programming	ES	2	0	2	0

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Department of Civil Engineering

I YEAR – I SEMESTER

Sl. No	Category	Course Code	Course Title	L	T	P	Credits
1	BS&H	23BE101T	Communicative English	2	0	0	2
2	BS&H	23BM101T	Linear Algebra and Calculus	3	0	0	3
3	BS&H	23BC101T	Engineering Chemistry	3	0	0	3
4	Engineering Science	23CM101T	Basic Civil and Mechanical Engineering	3	0	0	3
5	Engineering Science	23CS101T	Introduction to Programming	3	0	0	3
6	Engineering Science	23ME102P	Engineering Workshop	0	0	3	1.5
7	BS&H	23BE101P	Communicative English Laboratory	0	0	2	1
8	Engineering Science	23CS101P	Computer Programming Laboratory	0	0	3	1.5
9	BS&H	23BC101P	Engineering Chemistry Laboratory	0	0	2	1
10	BS&H	23MH101P	Health and wellness, Yoga and sports	0	0	1	0.5
Total Credits							**19.5**

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Department of Civil Engineering

I YEAR – II SEMESTER

Sl. No	Category	Course Code	Course Title	L	T	P	Credits
1	BS&H	23BP201T	Engineering Physics	3	0	0	3
2	BS&H	23BM201T	Differential Equations and Vector Calculus	3	0	0	3
3	Engineering Science	23EE201T	Basic Electrical and Electronics Engineering	3	0	0	3
4	Engineering Science	23ME201T	Engineering Graphics	1	0	4	3
5	Professional Core	23ME202T	Engineering Mechanics	3	0	0	3
6	BS&H	23BP201P	Engineering Physics Laboratory	0	0	2	1
7	Engineering Science	23EE201P	Electrical and Electronics Engineering Workshop	0	0	3	1.5
8	Professional Core	23CE201P	Engineering Mechanics and Building Practices Laboratory	0	0	3	1.5
9	Engineering Science	23IT201P	IT Workshop	0	0	2	1
10	BS&H	23MH202P	NSS/NCC/Scouts and Guides/Community Service	0	0	1	0.5
Total Credits							**20.5**

PRAGATI ENGINEERING COLLEGE: SURAMPALEM
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COURSE STRUCTURE

II YEAR I SEMESTER

Sl. No	Category	Course Code	Course Title	L	T	P	Credits
1	BS&H	23BM301T	Numerical Techniques And Statistical Methods	3	0	0	3
2	HSMC	23HM301T	Universal human values – understanding harmony and Ethical human conduct	2	1	0	3
3	Engineering Science	23CE301T	Surveying	3	0	0	3
4	Professional Core	23CE302T	Strength of Materials	3	0	0	3
5	Professional Core	23CE303T	Fluid Mechanics	3	0	0	3
6	Professional Core	23CE301P	Surveying Laboratory	0	0	3	1.5
7	Professional Core	23CE302P	Strength of Materials Laboratory	0	0	3	1.5
8	Skill Enhancement Course	23CE301S	Building Planning and Drawing	0	1	2	2
			Total	**14**	**2**	**8**	**20**
9	Audit Course	23BC301T	Environmental Science	2	0	0	-

II YEAR II SEMESTER

Sl. No	Category	Course Code	Course Title	L	T	P	Credits
1	Management Course-I	23HM401T	Managerial Economics and Financial Analysis	2	0	0	2
2	Engineering Science / Basic Science	23CE401T	Engineering Geology	3	0	0	3
3	Professional Core	23CE402T	Concrete Technology	3	0	0	3
4	Professional Core	23CE403T	Structural Analysis	3	0	0	3
5	Professional Core	23CE404T	Hydraulics & Hydraulic Machinery	3	0	0	3
6	Professional Core	23CE402P	Concrete Technology Laboratory	0	0	3	1.5
7	Professional Core	23CE401P	Engineering Geology Laboratory	0	0	3	1.5
8	Skill Enhancement course	23CE401S	Remote Sensing& Geographical Information Systems	0	1	2	2
9	Engineering Science	23HM401P	Design Thinking & Innovation	1	0	2	2
			Total	**15**	**1**	**10**	**21**
10	Mandatory course	23CE405T	Building materials and Construction	3	0	0	-
Mandatory Community Service Project Internship of 08 weeks duration during summer vacation							

PRAGATI ENGINEERING COLLEGE

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Department of Civil Engineering

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B.Tech. III Year I Semester

S. No	Course Code	Category	Course Title	L	T	P	Credits
1.	23CE501T	Professional Core	Design and Drawing of Reinforced Concrete Structures	2	0	0	3
2.	23CE502T	Professional Core	Engineering Hydrology	3	0	0	3
3.	23CE503T	Professional Core	Geotechnical Engineering -I	3	0	0	3
4.	1. 23CE504T 2. 23CE505T 3. 23CE506T **MOOCs** 23CE507T	Professional Elective-I	1. Advanced structural analysis 2. Architecture and town planning 3. Construction Technology and Management **4. Any of the 12- Week Swayam / NPTEL (MOOCs)** I. Admixtures and special Concrete II. Introduction to Engineering Seismology III. Optimization Methods for Civil Engineering	3	0	0	3
5.	1. 23EE508T 2. 23ME509T 3. 23EC504T 4. 23CS506T	Open Elective-I	1. Renewable Energy Sources 2. Sustainable Energy Technologies 3. Electronic Devices and Circuits 4. Introduction to Cloud Computing	3	0	0	3
6.	23CE503L	Professional Core	Geotechnical Engineering Laboratory	0	0	3	1.5
7.	23CE5011L	Professional Core	Fluid Mechanics and Hydraulic Machines Laboratory	0	0	3	1.5
8.	23CE5012L/ 23CS501S	Skill Enhancement course	Estimation, Specifications and Contracts/ Salesforce Administrator Explorer	0	1	2	2
9.	23EC5018L	Engineering Science	Tinkering Lab	0	0	2	1
10.	23CE501P	Community Service Project Internship		-	-	-	2
Total Credits							**23**

PRAGATI ENGINEERING COLLEGE

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B.Tech III Year II Semester

Sl. No	Course Code	Category	Course Title	L	T	P	Credits
1.	23CE601T	Professional Core	Design and Drawing of Steel Structures	3	0	0	3
2.	23CE602T	Professional Core	Highway Engineering	3	0	0	3
3.	23CE603T	Professional Core	Environmental Engineering	3	0	0	3
4.	1. 23CE604T 2. 23CE605T 3. 23CE606T **MOOCs** 23CE607T	Professional Elective-II	1. Ground Improvement Techniques 2. Repair and Rehabilitation of Structures 3. Valuation and Quantity Survey 4. **Any of the 12- Week Swayam / NPTEL (MOOCs)** I. Sustainable Transportation Systems II. Pavement Materials (Under Pavement Engineering) III. Underground Space Technology	3	0	0	3
5.	1. 23CE608T 2. 23CE609T 3. 23CE6010T **MOOCs** 23CE6011T	Professional Elective-III	1. Finite element method 2. Bridge Engineering 3. Water Resource Engineering **4. Any of the 12- Week Swayam / NPTEL (MOOCs)** I. Earthquake seismology II. Integrated waste management for a smart city III. Introduction to Multimodal Urban Transportation Systems (MUTS)	3	0	0	3
6.	1. 23EE6010T 2. 23ME6012T 3. 23EC6013T 4. 23CS604T 5. 23HM601T	Open Elective-II	1. Fundamentals of Electric Vehicles 2. Additive Manufacturing 3. Principles of Communications 4. Object oriented programming through java 5. Entrepreneurship and Venture Creation	3	0	0	3
7.	23CE603L	Professional Core	Environmental Engineering laboratory	0	0	3	1.5
8.	23CE602L	Professional Core	Highway Engineering laboratory	0	0	3	1.5
9.	23CE6015L/ 23CS602S	Skill Enhancement course	CAD Lab/ Salesforce Developer Catalyst	0	1	2	2
Total Credits				**18**	**1**	**08**	**23**
10.	23CM601T	Audit Course	Technical Paper Writing	2	0	0	-
Total Credits							**23**
Mandatory Industry Internship of 08 weeks duration during summer vacation							

Pragati Engineering College (Autonomous)

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I Year I Semester
COMMUNICATIVE ENGLISH
(Common to CE, EEE, ME, ECE, CSE (CS) and IT)

Course Category	Humanities	**Course Code**	23BE101T
Course Type	Theory	**L-T-P-C**	2-0-0-2
Prerequisites	LSRW Skills	**Continuous Internal Assessment** **Semester End Examination** **Total Marks**	30 70 100

COURSE OBJECTIVES	
1	The main objective of introducing this course, Communicative English, is to facilitate effective listening, Reading, Speaking and Writing skills among the students.
2	It enhances the same in their comprehending abilities, oral presentations, reporting useful information and providing knowledge of grammatical structures and vocabulary.
3	This course helps the students to make them effective in speaking and writing skills and to make them industry ready.

COURSE OUTCOMES		
Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Understand the context, topic, and pieces of specific information from social or Transactional dialogues.	K2
CO2	Apply grammatical structures to formulate sentences and correct word forms.	K3
CO3	Analyze discourse markers to speak clearly on a specific topic in informal discussions.	K4
CO4	Evaluate reading / listening texts and to write summaries based on glob	K5
CO5	Create a coherent paragraph, essay, and resume.	K4

K1- Remembering, K2- Understanding, K3-Applying, K4- Analyzing, K5- Evaluating, K6- Creating

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

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

Pragati Engineering College (Autonomous)

COURSE CONTENT

UNIT I

Lesson: HUMAN VALUES: Gift of Magi (Short Story)

Listening: Identifying the topic, the context and specific pieces of information by listening to short audio texts and answering a series of questions.

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

Reading: Skimming to get the main idea of a text; scanning to look for specific pieces of information.

Writing: Mechanics of Writing-Capitalization, Spellings, Punctuation-Parts of Sentences.

Grammar: Parts of Speech, Basic Sentence Structures-forming questions.

Vocabulary: Synonyms, Antonyms, Affixes (Prefixes/Suffixes), Root words.

UNIT II

Lesson: NATURE: The Brook by Alfred Tennyson (Poem)

Listening: Answering a series of questions about main ideas and supporting ideas after listening to audio texts.

Speaking: Discussion in pairs/small groups on specific topics followed by short structure talks.

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

Writing: Structure of a paragraph - Paragraph writing (specific topics)

Grammar: Cohesive devices - linkers, use of articles and zero article; Prepositions.

Vocabulary: Homonyms, Homophones, Homographs.

UNIT III

Lesson: BIOGRAPHY: Elon Musk

Listening: Listening for global comprehension and summarizing what is listened to.

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

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

Writing: Summarizing, Note-making, paraphrasing.

Grammar: Verbs - tenses; subject-verb agreement; Compound words, Collocations.

Vocabulary: Compound words, Collocations.

UNIT IV

Lesson: INSPIRATION: The Toys of Peace by Saki

Listening: Making predictions while listening to conversations/ transactional dialogues without video; listening with video.

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

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

Writing: Letter Writing: Official Letters, Resumes

Grammar: Reporting verbs, Direct & Indirect speech, Active & Passive Voice

Vocabulary: Words often confused, Jargons.

UNIT V

Lesson: MOTIVATION: The Power of Intrapersonal Communication (An Essay)

Listening: Identifying key terms, understanding concepts and answering a series of relevant questions that test comprehension.

Speaking: Formal oral presentations on topics from academic contexts.

Reading: Reading comprehension.

Writing: Writing structured essays on specific topics.

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

Vocabulary: Technical Jargons.

TEXT BOOKS

1. Pathfinder: Communicative English for Undergraduate Students, 1st Edition, OrientBlack Swan, 2023. (Units 1,2 & 3)
2. Empowering with Language by Cengage Publications, 2023 (Units 4 & 5).

REFERENCE BOOKS

1. Dubey, Sham Ji & Co. English for Engineers, Vikas Publishers, 2020
2. Bailey, Stephen. Academic writing: A Handbook for International Students. Routledge,2014
3. Murphy, Raymond. English Grammar in Use, Fourth Edition, Cambridge UniversityPress, 2019.
4. Lewis, Norman. Word Power Made Easy- The Complete Handbook for Building a Superior Vocabulary. Anchor, 2014.

WEB RESOURCES

1. www.bbc.co.uk/learningenglish
2. https://dictionary.cambridge.org/grammar/british-grammar/
3. www.eslpod.com/index.html
4. https://www.learngrammar.net/
5. https://english4today.com/english-grammar-online-with-quizzes/
6. https://www.talkenglish.com/grammar/grammar.aspx

VOCABULARY

1. https://www.youtube.com/c/DailyVideoVocabulary/videos
2. https://www.youtube.com/channel/UC4cmBAit8i_NJZE8qK8sfpA

Pragati Engineering College (Autonomous)

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I Year I Semester
LINEAR ALGEBRA AND CALCULUS
(Common to All Branches)

Course Category	Basic Sciences	**Course Code**	23BM101T
Course Type	Theory	**L-T-P-C**	3-0-0-3
Prerequisites	Matrix Algebra, Limits, Continuity, Differentiability and integrability	**Continuous Internal Assessment** **Semester End Examination** **Total Marks**	30 70 100

COURSE OBJECTIVES
To equip the students with standard concepts and tools at an intermediate to advanced level mathematics to develop the confidence and ability among the students to handle various real-world problems and their applications.

COURSE OUTCOMES		
Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Develop and use of matrix algebra techniques that are needed by engineers for practical applications.	K3
CO2	Find the Eigen values and Eigen vectors and able to reduce the given quadratic form into canonical form by orthogonal transformation.	K3
CO3	Utilize mean value theorems to real life problems.	K3
CO4	Familiarize with functions of several variables which is useful in optimization & learn important tools of calculus in higher dimensions	K3
CO5	Familiarize with double and triple integrals of functions of several variables in two dimensions using Cartesian and polar coordinates and in three dimensions using cylindrical and spherical coordinates.	K3

K1- Remembering, K2- Understanding, K3-Applying, K4- Analyzing, K5- Evaluating, K6- Creating

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)												
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3	3	2	-	-	-	-	-	-	-	-	-
CO2	3	3	2	-	-	-	-	-	-	-	-	-
CO3	3	3	2	-	-	-	-	-	-	-	-	-
CO4	3	3	2	-	-	-	-	-	-	-	-	-
CO5	3	3	2	-	-	-	-	-	-	-	-	-

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COURSE CONTENT

UNIT I

Matrices:

Rank of a matrix by echelon form, normal form. Cauchy–Binet formulae (without proof). Inverse of Non- singular matrices by Gauss-Jordan method, **System of linear equations**: Solving system of Homogeneous linear equations and solving Non-Homogeneous linear equations by Gauss elimination method, Gauss Jacobi and Gauss Seidel Iteration Methods**.**

UNIT II

Eigenvalues, Eigenvectors and Orthogonal Transformation:

Eigenvalues, Eigenvectors and their properties, Cayley-Hamilton Theorem (without proof), finding inverse and power of a matrix by Cayley-Hamilton Theorem, Diagonalization of a matrix, Quadratic forms and Nature of the Quadratic Forms, Reduction of Quadratic form to canonical forms by Orthogonal Transformation.

UNIT III

Calculus:

Mean Value Theorems: Rolle's Theorem, Lagrange's mean value theorem with their geometrical interpretation, Cauchy's mean value theorem, Taylor's and Maclaurin theorems with remainders (without proof), Problems and applications on the above theorems. Taylor's and Maclaurin series.

UNIT IV

Partial differentiation and Applications (Multi variable calculus):

Functions of several variables: Continuity and Differentiability, Partial derivatives, total derivatives, chain rule, Taylor's and Maclaurin's series expansion of functions of two variables. Jacobians, Functional dependence, maxima and minima of functions of two variables, method of Lagrange multipliers.

UNIT V

Multiple Integrals (Multi variable Calculus):

Double integrals, change of order of integration, triple integrals, change of variables to polar, cylindrical and spherical coordinates. Finding areas (by double integrals) and volumes (by double integrals and triple integrals).

TEXT BOOKS

1. Higher Engineering Mathematics, B. S. Grewal, Khanna Publishers, 2017, 44th Edition
2. Advanced Engineering Mathematics, Erwin Kreyszig, John Wiley & Sons, 2018, 10th Edition.

REFERENCE BOOKS

1. Thomas Calculus, George B. Thomas, Maurice D. Weir and Joel Hass, Pearson Publishers, 2018, 14th Edition.
2. Advanced Engineering Mathematics, R. K. Jain and S. R. K. Iyengar, Alpha Science International Ltd., 2021 5th Edition (9th reprint).
3. Advanced Modern Engineering Mathematics, Glyn James, Pearson publishers, 2018, 5th Edition.
4. Advanced Engineering Mathematics, Micheael Greenberg, , Pearson publishers, 9th edition.
5. Higher Engineering Mathematics, H. K Das, Er. Rajnish Verma, S. Chand Publications,2014, Third Edition (Reprint 2021)
6. Advanced Engineering Mathematics by H. K Dass, S. Chand Publications, 2022, 22nd Edition (Reprint 2022).

WEB RESOURCES

1. https://en.wikipedia.org/wiki/System_of_linear_equations
2. https://en.wikipedia.org/wiki/Eigenvalues_and_eigenvectors
3. https://www.math.hmc.edu/calculus/tutorials/eigenstuff/
4. https://en.wikipedia.org/wiki/Quadratic_form
5. https://en.wikipedia.org/wiki/Calculus
6. https://en.wikipedia.org/wiki/Partial_derivative
7. https://www.whitman.edu/mathematics/calculus_online/section14.03.html
8. https://en.wikipedia.org/wiki/Multiple_integral
9. http://tutorial.math.lamar.edu/Classes/CalcIII/MultipleIntegralsIntro.aspx

Pragati Engineering College (Autonomous)

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I Year I Semester
ENGINEERING CHEMISTRY
(Common to CE and MECH)

Course Category	Basic Science	**Course Code**	23BC101T
Course Type	Theory	**L-T-P-C**	3-0-0-3
Prerequisites		**Continuous Internal Assessment** **Semester End Examination** **Total Marks**	30 70 100

COURSE OBJECTIVES	
1	To familiarize engineering chemistry and its applications
2	To impart the concept of soft and hard waters, softening methods of hard water
3	To train the students on the principles and applications of electrochemistry, polymers, surface chemistry, and cement

COURSE OUTCOMES		
Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Compare the quality of drinking water with BIS and WHO Standards	K2
CO2	Illustrate the principles and applications of Batteries, Fuel cells and fuels.	K2
CO3	Explain calorific values, octane number, refining of petroleum and crack in go foils.	K2
CO4	Explain the setting and hardening of cement.	K2
CO5	Summarize the concepts of colloids, Micelle and nano materials.	K4

K1- Remembering, K2- Understanding, K3-Applying, K4- Analyzing, K5- Evaluating, K6- Creating

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

CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3	1	2	2	2		2	2	1	1	2	2
CO2	2	2	1			1	1				1	
CO3	1	1		1	2				2		2	1
CO4	2	2		1			1			2		1
CO5	**1**	1	1				1				2	1

COURSE CONTENT

UNIT -I

Water Technology

Soft and hard water, Estimation of hardness of water by EDTA Method, Estimation of dissolved Oxygen - Boiler troubles–Priming, foaming**,** scale and sludge, Caustic embrittlement, Industrial water treatment–Specifications for drinking water, Bureau of Indian Standards (BIS) and World health organization(WHO) standards, Removal of hardness of water by Ion-exchange processes - desalination of brackish water, reverse osmosis (RO) and electro dialysis.

UNIT - II

Electrochemistry and Applications

Electrodes–electrochemical cell, Nernst equation, cell potential calculations.

Primary cells – Zinc-air battery, Secondary cells – Nickel-Cadmium (Ni -Cd), and lithium ion batteries -working principle of the batteries Including cell reactions; Fuel Cells-Basic Concepts, the Principle and working of hydrogen-oxygen Fuel cell.

Corrosion: Introduction to corrosion, metal oxide formation by dry electrochemical corrosion, Pilling-Bedworth ratios and uses electrochemical theory of corrosion, differential aeration cell corrosion, galvanic corrosion, Factors affecting the corrosion (Nature of the metal and nature of the environment), Corrosion controlling methods: *cathodic and anodic protection, electroplating and electro less plating (Nickel and Copper).*

UNIT - III

Polymers and Fuel Chemistry

Introduction to polymers, functionality of monomers, Mechanism of chain growth, step growth polymerization.

Thermo plastics and Thermo-setting plastics- Preparation, properties and applications of polystyrene, PVC, Nylon 6, 6 and Bakelite.

Elastomers–Preparation, properties and applications of BunaS, BunaN, Thiokolrubbers.

Fuels – Types of fuels, calorific value of fuel- HCV&LCV- Dulong's formula *-numerical problems based on calorific value; Analysis of coal (Proximate and Ultimate analysis), Liquid Fuels, refining of petroleum, Octane and Cetanenumber- Alternative fuel-Ethanol and bio fuel-bio diesel.*

UNIT– IV

Modern Engineering Materials

Composites- Definition, Constituents, Classification- Particle, Fibre and Structural rein forced composites, properties and Engineering applications

Refractories-Classification, Properties, Factors affecting the refractory materials and Applications.

Lubricants-Classification, Functions of lubricants, Mechanism, Properties of lubricating oils–Viscosity, Viscosity Index, Flash point, Fire point, Cloud point, saponification and Applications.

Building materials- Portland Cement-constituents and manufacturing – Setting and Hardening of cement.

UNIT -V

Surface Chemistry and Nano materials

Introduction to surface chemistry, colloids, Micelle formation, synthesis of colloids (Braggs Method), chemical and biological methods of preparation of Nano metals and Metal oxides, stabilization of colloids and nano materials by stabilizing agents, adsorption isotherm (Freundlich and Longmuir), BET equation (noderivation) applications of colloids and nano materials– catalysis, medicine, sensors, etc.

Textbooks:

1. Jain and Jain, Engineering Chemistry, 16/e, DhanpatRai,2013.
2. PeterAtkins, Juliode Paula and James Keeler, Atkins' Physical Chemistry, 10/e, Oxford University Press, 2010.

Reference Books:

1. H.F.W.Taylor, Cement Chemistry, 2/e, Thomas Telford Publications,1997.
2. D.J. Shaw, Introduction to Colloids and Surface Chemistry, Butterworth-Heineman, 1992.
3. Text book of Polymer Science, Fred W.BillmayerJr,3rdEdition

WEB RESOURCES

UNIT –I

Water Technology : *https://nptel.ac.in/courses/105106119*

UNIT - II

Electrochemistry and Applications:*https://archive.nptel.ac.in/courses/103/105/103105110/*

UNIT - III

Polymers andFuel Chemistry

https://archive.nptel.ac.in/content/storage2/courses/113104058/lecture1/1_7.htm

UNIT – IV

Modern Engineering Materials:

https://archive.nptel.ac.in/courses/105/102/105102012/

https://www.thelubricantstore.com/lubricant-properties

UNIT -V

Surface Chemistry and Nano materials

https://digimat.in/nptel/courses/video/103103154/L24.html

Pragati Engineering College (Autonomous)

R23

I Year I Semester
BASIC CIVIL AND MECHANICAL ENGINEERING
(Common to CE, EEE, ME, ECE, CSE (CS) and IT)

Course Category	Engineering Science	**Course Code**	23CM101T
Course Type	Theory	**L-T-P-C**	3-0-0-3
Prerequisites		**Continuous Internal Assessment** **Semester End Examination** **Total Marks**	30 70 100

PART-A: BASIC CIVIL ENGINEERING

COURSE OBJECTIVES	
1	Get familiarized with the scope and importance of Civil Engineering sub-divisions
2	Introduce the preliminary concepts of surveying.
3	Acquire preliminary knowledge on Transportation and its importance in nation's economy.
4	Get familiarized with the importance of quality, conveyance and storage of water.
5	Introduction to basic civil engineering materials and construction techniques.

COURSE OUTCOMES		
Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	enlist various basic characteristics and sub-divisions of Civil Engineering, pre-fabricated materials and technology to appreciate their role in ensuring better society.	K2
CO2	illustrate the concepts of surveying and basics of Foundation Engineering.	K3
CO3	know the significance of various domains in transportation engineering and be acquitted with types of pavements. Get an overview about Environmental Engineering and Water Resource Engineering.	K3

K1- Remembering, K2- Understanding, K3-Applying, K4- Analyzing, K5- Evaluating, K6- Creating

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

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

COURSE CONTENT

UNIT I

Basics of Civil Engineering: Role of Civil Engineers in Society- Various Disciplines of Civil Engineering- Structural Engineering- Geo-technical Engineering- Transportation Engineering -Hydraulics and Water Resources Engineering - Environmental Engineering-Scope of each discipline - Building Construction and Planning- Construction Materials-Cement- Aggregate - Bricks-Stones-Sand-Cement Concrete-Steel-Timber. Introduction to Prefabricated construction Techniques.

UNIT II

Surveying: Objectives of Surveying- Horizontal Measurements- Angular Measurements Introduction to Bearings Levelling instruments used for levelling -Simple problems on levelling and bearings-Contour mapping.

Foundations: Types of foundations — Bearing capacity and settlement — Requirement of good foundations.

UNIT III

Transportation Engineering: Importance of Transportation in Nation's economic development- Types of Highway Pavements- Flexible Pavements and Rigid Pavements - Simple Differences. Basics of Harbour, Tunnel, Airport, and Railway Engineering.

Water Resources and Environmental Engineering: Introduction, Sources of water- Quality of water- Specifications- Introduction to Hydrology–Rainwater Harvesting-Water Storage and Conveyance Structures (Simple introduction to Dams and Reservoirs).

TEXT BOOKS

1. Basic Civil Engineering, M.S.Palanisamy, Tata Mcgraw Hill publications (India) Pvt. Ltd. Fourth Edition.
2. Introduction to Civil Engineering, S.S. Bhavikatti, New Age International Publishers. 2022. First Edition.
3. Basic Civil Engineering, Satheesh Gopi, Pearson Publications, 2009, First Edition.

REFERENCE BOOKS

1. Surveying, Vol- I and Vol-II, S.K. Duggal, Tata McGraw Hill Publishers 2019. Fifth Edition.
2. Hydrology and Water Resources Engineering, Santosh Kumar Garg, Khanna Publishers, Delhi. 2016
3. Irrigation Engineering and Hydraulic Structures - Santosh Kumar Garg, Khanna Publishers, Delhi 2023. 38th Edition.
4. Highway Engineering, S.K.Khanna, C.E.G. Justo and Veeraraghavan, Nemchand and Brothers Publications 2019. 10th Edition.
5. Indian Standard DRINKING WATER — SPECIFICATION IS 10500-2012.

WEB RESOURCES

1. https://nptel.ac.in/courses/105101087
2. https://nptel.ac.in/courses/105104101
3. https://nptel.ac.in/courses/105104103

PART – B: BASIC MECHANICAL ENGINEERING

COURSE OBJECTIVES	
1	Get familiarized with the scope and importance of Mechanical Engineering in different sectors and industries.
2	Explain different engineering materials and different manufacturing processes.
3	Provide an overview of different thermal and mechanical transmission systems and introduce basics of robotics and its applications.

COURSE OUTCOMES		
Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Understand the different manufacturing processes.	K2
CO2	Explain the basics of thermal engineering and its applications.	K3
CO3	Describe the working of different mechanical power transmission systems, power plants and basics of robotics and its applications.	K3

K1- Remembering, K2- Understanding, K3-Applying, K4- Analyzing, K5- Evaluating, K6- Creating

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)												
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3	-	-	-	-	-	-	-	-	-	2	-
CO2	3	-	-	-	-	-	-	-	-	-	2	-
CO3	3	-	-	-	-	-	-	-	-	-	2	-

COURSE CONTENT

UNIT - I

Introduction to Mechanical Engineering: Role of Mechanical Engineering in Industries and Society-Technologies in different sectors such as Energy, Manufacturing, Automotive, Aerospace, and Marine sectors.

Engineering Materials - Metals-Ferrous and Non-ferrous, Ceramics, Composites, Smart materials.

UNIT - II

Manufacturing Processes: Principles of Casting**,** Forming, joining processes, Machining, Introduction to CNC machines, 3D printing, and Smart manufacturing.

Thermal Engineering – working principle of Boilers, Otto cycle, Diesel cycle, Refrigeration and air-conditioning cycles, IC engines, 2-Stroke and 4-Stroke engines, SI/CI Engines, Components of Electric and Hybrid Vehicles.

UNIT - III

Power plants – working principle of Steam, Diesel, Hydro, Nuclear power plants.

Mechanical Power Transmission - Belt Drives, Chain, Rope drives, Gear Drives and their applications.

Introduction to Robotics - Joints & links, configurations, and applications of robotics.

(Note: The subject covers only the basic principles of Civil and Mechanical Engineering systems. The evaluation shall be intended to test only the fundamentals of the subject)

Textbooks:

1. Internal Combustion Engines by V.Ganesan, By Tata McGraw Hill publications (India) Pvt. Ltd.
2. A Tear book of Theory of Machines by S.S. Rattan, Tata McGraw Hill Publications, (India) Pvt. Ltd.
3. An introduction to Mechanical Engg by Jonathan Wicker and Kemper Lewis, Cengage learning India Pvt. Ltd.

Reference Books:

1. AppuuKuttan KK, Robotics, I.K. International Publishing House Pvt. Ltd. Volume-I.
2. 3D printing & Additive Manufacturing Technology- L. Jyothish Kumar, Pulak M Pandey, Springer publications.
3. Thermal Engineering by Mahesh M Rathore Tata McGraw Hill publications (India) Pvt. Ltd.
4. G. Shanmugam and M.S.Palanisamy, Basic Civil and the Mechanical Engineering, Tata McGraw Hill publications (India) Pvt. Ltd.

Web References:

1. https://ocw.mit.edu/courses/2-000-how-and-why-machines-work-spring-2002/
2. https://ocw.mit.edu/courses/2-008-design-and-manufacturing-ii-spring-2004/
3. https://ocw.mit.edu/courses/2-12-introduction-to-robotics-fall-2005/

Pragati Engineering College (Autonomous)

R23

I Year I Semester

INTRODUCTION TO PROGRAMMING

(Common to All Branches)

Course Category	Engineering Science	**Course Code**	23CS101T
Course Type	Theory	**L-T-P-C**	3-0-0-3
Prerequisites		**Continuous Internal Assessment** **Semester End Examination** **Total Marks**	30 70 100

COURSE OBJECTIVES	
1	To introduce students to the fundamentals of computer programming.
2	To provide hands-on experience with coding and debugging.
3	To foster logical thinking and problem-solving skills using programming.
4	To familiarize students with programming concepts such as data types, control structures, functions, and arrays.
5	To encourage collaborative learning and teamwork in coding projects.

COURSE OUTCOMES		
Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Understand basics of computers, the concept of algorithm and algorithmic thinking.	K3
CO2	Analyze a problem and develop an algorithm to solve it.	K4
CO3	Implement various algorithms using the C programming language.	K5
CO4	Understand more advanced features of C language.	K3
CO5	Develop problem-solving skills and the ability to debug and optimize the code.	K4

K1- Remembering, K2- Understanding, K3-Applying, K4- Analyzing, K5- Evaluating, K6- Creating

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

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

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COURSE CONTENT

UNIT- I

Introduction to Programming and Problem Solving

History of Computers, Basic organization of a computer: ALU, input-output units, memory, program counter, Introduction to Programming Languages, Basics of a Computer Program-Algorithms, flowcharts (Using Dia Tool), pseudo code. Introduction to Compilation and Execution, Primitive Data Types, Variables and Constants, Basic Input and Output, Operations, Type Conversion and Casting.

Problem solving techniques: Algorithmic approach, characteristics of algorithm, Problem solving strategies: Top-down approach, Bottom-up approach, Time and space complexities of algorithms.

UNIT -II

Control Structures

Simple sequential programs, Conditional Statements (if, if-else, switch), Loops (for, while, do-while) Break and Continue, Programming Examples.

UNIT -III

Arrays and Strings

Arrays indexing, memory model, programs with array of integers, two dimensional arrays, Arrays Applications , Introduction to Strings, String input and output functions, String handling functions.

UNIT -IV

Pointers & User Defined Data types

Pointers, dereferencing and address operators, pointer and address arithmetic, array manipulation using pointers, User-defined data types-Structures and Unions.

UNIT -V

Functions & File Handling

Introduction to Functions, Function Declaration and Definition, Function call Return Types and Arguments, modifying parameters inside functions using pointers, arrays as parameters. Scope and Lifetime of Variables, Storage Classes, Basics of File Handling.

Note: The syllabus is designed with C Language as the fundamental language of implementation.

TEXT BOOKS

1. "The C Programming Language", Brian W. Kernighan and Dennis M. Ritchie, Prentice- Hall, 2005, 2nd Edition
2. Schaum's Outline of Programming with C, Byron S Gottfried, McGraw-Hill Education, 4th edition, 2018

REFERENCE BOOKS

1. Computing fundamentals and C Programming, Balaguruswamy, E., McGraw-Hill Education, 7th Edition, 2017
2. Programming in C, Rema Theraja, Oxford, 2016, 2nd edition
3. C Programming, A Problem Solving Approach, Forouzan, Gilberg, Prasad, CENGAGE, 3rdedition, 2009

WEB RESOURCES

1. http://nptel.ac.in/courses/106104128/
2. http://students.iitk.ac.in/programmingclub/course/#notes
3. http://c-faq.com/~scs/cclass/cclass.html

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R23

I Year I Semester
ENGINEERING WORKSHOP
(Common to CE, EEE, ME, ECE, CSE(CS) and IT)

Course Category	Engineering Science	**Course Code**	23ME102P
Course Type	Laboratory	**L-T-P-C**	0-0-3-1.5
Prerequisites		**Continuous Internal Assessment**	30
		Semester End Examination	70
		Total Marks	100

COURSE OBJECTIVES
To familiarize students with wood working, sheet metal operations, fitting and electrical house wiring skills

COURSE OUTCOMES		
Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Identify workshop tools and their operational capabilities.	K2
CO2	Practice on manufacturing of components using workshop trades including fitting, carpentry, foundry and welding.	K3
CO3	Apply knowledge in preparation of pipe joints and practice of Plumbing tools.	K3
CO4	Apply basic electrical engineering knowledge for House Wiring Practice	K3

K1- Remembering, K2- Understanding, K3-Applying, K4- Analyzing, K5- Evaluating, K6- Creating

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

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	-	3	1	3	-	-	-	-	3	-	-
CO2	3	-	3	1	3	-	-	-	-	3	-	-
CO3	3	-	3	1	3	-	-	-	-	3	-	-
CO4	3	-	3	1	3	-	-	-	-	3	-	-

COURSE CONTENT

1.**Demonstration**: Safety practices and precautions to be observed in workshop.

2. **Wood Working:** Familiarity with different types of woods and tools used in wood working and make following joints.

a) Half – Lap joint b) Mortise and Tenon joint c) Corner Dovetail joint or Bridle joint

3. **Sheet Metal Working**: Familiarity with different types of tools used in sheet metal working, Developments of following sheet metal job from GI sheets.

a) Tapered tray b) Conical funnel c) Elbow pipe d) Brazing

4. **Fitting:** Familiarity with different types of tools used in fitting and do the following fitting exercises.

a) V-fit b) Dovetail fit c) Semi-circular fit d) Bicycle tire puncture and change of two-wheeler tire

5. **Electrical Wiring**: Familiarity with different types of basic electrical circuits and make the following connections.

a) Parallel and series b) Two-way switch c) Godown lighting d) Tube light e) Three phase motor f) Soldering of wires

6. **Foundry Trade:** Demonstration and practice on Moulding tools and processes, Preparation of Green Sand Moulds for given Patterns.

7. **Welding Shop**: Demonstration and practice on Arc Welding and Gas welding. Preparation of Lap joint and Butt joint.

8. **Plumbing:** Demonstration and practice of Plumbing tools, Preparation of Pipe joints with coupling for same diameter and with reducer for different diameters.

Note: Minimum of 12 Experiments to be conducted from the above covering all the trades.

Textbooks:

1. Basic Workshop Technology: Manufacturing Process, Felix W.; Independently Published,2019. Workshop Processes, Practices and Materials; Bruce J. Black, Routledge publishers, 5th Edn. 2015.

2. A Course in Workshop Technology Vol I. & II, B.S. Raghuwanshi, Dhanpath Rai & Co., 2015 & 2017.

Reference Books:

1. Elements of Workshop Technology, Vol. I by S. K. Hajra Choudhury & Others, Media Promoters and Publishers, Mumbai. 2007, 14th edition

2. Workshop Practice by H. S. Bawa, Tata-McGraw Hill, 2004.

3. Wiring Estimating, Costing and Contracting; Soni P.M. & Upadhyay P.A.; Atul Prakashan, 2021-22.

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R23

I Year I Semester

COMMUNICATIVE ENGLISH LABORATORY

(Common to CE, EEE, ME, ECE, CSE (CS) and IT)

Course Category	Humanities	**Course Code**	23BE101P
Course Type	Laboratory	**L-T-P-C**	0-0-2-1
Prerequisites	LSRW Skills	**Continuous Internal Assessment**	30
		Semester End Examination	70
		Total Marks	100

COURSE OBJECTIVES	
1	The main objective of introducing this course, Communicative English Laboratory, is to expose the students to a variety of self-instructional, learner friendly modes of language learning.
2	The students will get trained in basic communication skills and also make them ready to face job interviews.

COURSE OUTCOMES		
Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Understand the different aspects of the English language proficiency with emphasison LSRW skills.	K2
CO2	Apply communication skills through various language learning activities.	K3
CO3	Analyze the English speech sounds, stress, rhythm, intonation and syllable divisionfor better listening and speaking comprehension.	K4
CO4	Evaluate and exhibit professionalism in participating in debates and group discussions.	K5
CO5	Able to present ideas effectively and manage interviews confidently.	K4

K1- Remembering, K2- Understanding, K3-Applying, K4- Analyzing, K5- Evaluating, K6- Creating

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

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

COURSE CONTENT

UNIT - I

Communication Skills & JAM.
Role Play or Conversational Practice.

UNIT - II

E-mail Writing.
Resume Writing, Cover letter, SOP.

UNIT - III

Vowels & Consonants.
Neutralization/Accent Rules.

UNIT - IV

Group Discussions-methods & practice.
Debates - Methods & Practice.

UNIT - V

PPT Presentations/ Poster Presentation.
Interviews Skills.

Laboratory Manual Lab Book

1. Strengthen Your Steps: A Multi-Model Course in Communication Skills published by Maruti Publications

REFERENCE BOOKS

1. Raman Meenakshi, Sangeeta-Sharma. Technical Communication. Oxford Press.2018.
2. Taylor Grant: English Conversation Practice, Tata McGraw-Hill Education India,2016
3. Hewing's, Martin. Cambridge Academic English (B2). CUP, 2012.
4. J. Sethi & P.V. Dhamija. A Course in Phonetics and Spoken English, (2nd Ed),Kindle, 2013

WEB RESOURCES

Spoken English:

1. www.esl-lab.com
2. www.englishmedialab.com
3. www.englishinteractive.net
4. https://www.britishcouncil.in/english/online
5. http://www.letstalkpodcast.com/
6. https://www.youtube.com/c/mmmEnglish_Emma/featured
7. https://www.youtube.com/c/ArnelsEverydayEnglish/featured
8. https://www.youtube.com/c/engvidAdam/featured
9. https://www.youtube.com/c/EnglishClass101/featured
10. https://www.youtube.com/c/SpeakEnglishWithTiffani/playlists
11. https://www.youtube.com/channel/UCV1h_cBE0Drdx19qkTM0WNw

Voice & Accent:

1. https://www.youtube.com/user/letstalkaccent/videos
2. https://www.youtube.com/c/EngLanguageClub/featured

3. https://www.youtube.com/channel/UC_OskgZBoS4dAnVUgJVexc
4. https://www.youtube.com/channel/UCNfm92h83W2i2ijc5Xwp_IA

Suggested Software:

1. Walden Infotech
2. Young India Films

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R23

I Year I Semester
COMPUTER PROGRAMMING LABORATORY
(Common to All Branches)

Course Category	Engineering Science	**Course Code**	23CS101P
Course Type	Laboratory	**L-T-P-C**	0-0-3-1.5
Prerequisites		**Continuous Internal Assessment**	30
		Semester End Examination	70
		Total Marks	100

COURSE OBJECTIVES

The course aims to give students hands – on experience and train them on the concepts of the C-programming language.

COURSE OUTCOMES

Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Read, understand, and trace the execution of programs written in C language.	K3
CO2	Select the right control structure for solving the problem.	K3
CO3	Develop C programs which utilize memory efficiently using programming constructs like pointers.	K3
CO4	Develop, Debug and Execute programs to demonstrate the applications of arrays, functions, basic concepts of pointers in C.	K5

K1- Remembering, K2- Understanding, K3-Applying, K4- Analyzing, K5- Evaluating, K6- Creating

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

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	3	1	-	-	-	-	-	-	-
CO2	3	3	3	3	1	-	-	-	-	-	-	-
CO3	3	3	3	3	1	-	-	-	-	-	-	-
CO4	3	3	3	3	1	-	-	-	-	-	-	-

COURSE CONTENT

WEEK 1

Objective: Getting familiar with the programming environment on the computer and writing the first program.

Suggested Experiments/Activities:

Tutorial 1: Problem-solving using Computers.

Lab1: Familiarization with programming environment

i) Basic Linux environment and its editors like Vi, Vim & Emacs etc.
ii) Exposure to Turbo C, gcc
iii) Writing simple programs using printf(), scanf()

WEEK 2

Objective: Getting familiar with how to formally describe a solution to a problem in a series of finite stepsboth using textual notation and graphic notation.

Suggested Experiments /Activities:

Tutorial 2: Problem-solving using Algorithms and Flow charts.

Lab 2: Converting algorithms/flow charts into C Source code.

Developing the algorithms/flowcharts for the following sample programs

i) Sum and average of 3 numbers
ii) Conversion of Fahrenheit to Celsius and vice versa
iii) Simple interest calculation

WEEK 3

Objective: Learn how to define variables with the desired data-type, initialize them with appropriate values and how arithmetic operators can be used with variables and constants.

Suggested Experiments/Activities:

Tutorial 3: Variable types and type conversions:

Lab 3: Simple computational problems using arithmetic expressions.

i) Finding the square root of a given number
ii) Finding compound interest
iii) Area of a triangle using heron's formulae
iv) Distance travelled by an object

WEEK 4

Objective: Explore the full scope of expressions, type-compatibility of variables & constants and operatorsused in the expression and how operator precedence works.

Suggested Experiments/Activities:

Tutorial4: Operators and the precedence and as associativity:

Lab4: Simple computational problems using the operator' precedence and associativity

i) Evaluate the following expressions.
   a. A+B*C+(D*E) + F*G
   b. A/B*C-B+A*D/3
   c. A+++B---A
   d. J= (i++) + (++i)
ii) Find the maximum of three numbers using conditional operator
iii) Take marks of 5 subjects in integers, and find the total, average in float

WEEK 5

Objective: Explore the full scope of different variants of "if construct" namely if-else, null- else, if-else if*-else, switch and nested-if including in what scenario each one of them can be used and how to use them. Explore all relational and logical operators while writing conditionals for "if construct".

Suggested Experiments/Activities:

Tutorial 5: Branching and logical expressions:

Lab 5: Problems involving if-then-else structures.

i) Write a C program to find the max and min of four numbers using if-else.
ii) Write a C program to generate electricity bill.
iii) Find the roots of the quadratic equation.
iv) Write a C program to simulate a calculator using switch case.
v) Write a C program to find the given year is a leap year or not.

WEEK 6

Objective: Explore the full scope of iterative constructs namely while loop, do-while loop and

for loop in addition to structured jump constructs like break and continue including when each ofthese statements is more appropriate to use.

Suggested Experiments/Activities:

Tutorial 6: Loops, while and for loops
Lab 6: Iterative problems e.g., the sum of series

i) Find the factorial of given number using any loop.
ii) Find the given number is a prime or not.
iii) Compute sine and cos series
iv) Checking a number palindrome
v) Construct a pyramid of numbers.

WEEK 7

Objective: Explore the full scope of Arrays construct namely defining and initializing 1-D and 2-D and more generically n-D arrays and referencing individual array elements from the defined array. Using integer 1-D arrays, explore search solution linear search.

Suggested Experiments/Activities:

Tutorial 7: 1 D Arrays: searching.
Lab 7:1D Array manipulation, linear search

i) Find the min and max of a 1-D integer array.
ii) Perform linear search on1D array.
iii) The reverse of a 1D integer array
iv) Find 2's complement of the given binary number.
v) Eliminate duplicate elements in an array.

WEEK 8

Objective: Explore the difference between other arrays and character arrays that can be used as Strings by using null character and get comfortable with string by doing experiments that will reverse a string and concatenate two strings. Explore sorting solution bubble sort using integerarrays.

Suggested Experiments/Activities:
Tutorial 8: 2 D arrays, sorting and Strings.
Lab 8: Matrix problems, String operations, Bubble sort

i) Addition of two matrices
ii) Multiplication two matrices
iii) Sort array elements using bubble sort
iv) Concatenate two strings without built-in functions
v) Reverse a string using built-in and without built-in string functions

WEEK 9

Objective: Explore pointers to manage a dynamic array of integers, including memory allocation & value initialization, resizing changing and reordering the contents of an array and memory de-allocation using malloc (), calloc (), realloc () and free () functions. Gain experience processing command-line arguments received by C

Suggested Experiments/Activities:
Tutorial 9: Pointers, structures and dynamic memory allocation

Lab 9: Pointers and structures, memory dereference.

i) Write a C program to find the sum of a 1D array using malloc()
ii) Write a C program to find the total, average of n students using structures
iii) Enter n students data using calloc() and display failed students list
iv) Read student name and marks from the command line and display the student details alongwith the total.
v) Write a C program to implement realloc()

WEEK 10

Objective: Experiment with C Structures, Unions, bit fields and self-referential structures (Singlylinked lists) and nested structures

Suggested Experiments/Activities:

Tutorial 10: Bitfields, Self-Referential Structures, Linked lists

Lab10 : Bitfields, linked lists

i) Read and print a date using dd/mm/yyyy format using bit-fields and differentiate the same without using bit- fields.
ii) Create and display a singly linked list using self-referential structure.
iii) Demonstrate the differences between structures and unions using a C program.
iv) Write a C program to shift/rotate using bitfields.
v) Write a C program to copy one structure variable to another structure of the same type.

WEEK 11

Objective: Explore the Functions, sub-routines, scope and extent of variables, doing someexperiments by parameter passing using call by value. Basic methods of numerical integration **Suggested Experiments/Activities:**

Tutorial 11: Functions, call by value, scope and extent,

Lab 11: Simple functions using call by value, solving differential equations using Eulers theorem.

i) Write a C function to calculate NCR value.
ii) Write a C function to find the length of a string.
iii) Write a C function to transpose of a matrix.
iv) Write a C function to demonstrate numerical integration of differential equations using Euler's method

WEEK 12

Objective: Explore how recursive solutions can be programmed by writing recursive functions that can be invoked from the main by programming at-least five distinct problems that have naturally recursive solutions.

Suggested Experiments/Activities:

Tutorial 12: Recursion, the structure of recursive calls

Lab 12: Recursive functions

i) Write a recursive function to generate Fibonacci series.
ii) Write a recursive function to find the lcm of two numbers.
iii) Write a recursive function to find the factorial of a number.
iv) Write a C Program to implement Ackermann function using recursion.
v) Write a recursive function to find the sum of series.

WEEK 13

Objective: Explore the basic difference between normal and pointer variables, Arithmeticoperations using pointers and passing variables to functions using pointers

Suggested Experiments/Activities:

Tutorial 13: Call by reference, dangling pointers

Lab 13: Simple functions using Call by reference, Dangling pointers.

i) Write a C program to swap two numbers using call by reference.
ii) Demonstrate Dangling pointer problem using a C program.
iii) Write a C program to copy one string into another using pointer.
iv) Write a C program to find no of lowercase, uppercase, digits and other characters usingpointers.

WEEK 14

Objective: To understand data files and file handling with various file I/O functions. Explore thedifferences between text and binary files.

Suggested Experiments/Activities:

Tutorial 14: File handling

Lab 14: File operations

i) Write a C program to write and read text into a file.
ii) Write a C program to write and read text into a binary file using fread() and fwrite()
iii) Copy the contents of one file to another file.
iv) Write a C program to merge two files into the third file using command-line arguments.
v) Find no. of lines, words and characters in a file
vi) Write a C program to print last n characters of a given file.

TEXT BOOKS

1. Ajay Mittal, Programming in C: A practical approach, Pearson.
2. Byron Gottfried, Schaum ' s Outline of Programming with C, McGraw Hill

REFERENCE BOOKS

1. Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, Prentice-Hallof India
2. C Programming, A Problem-Solving Approach, Forouzan, Gilberg, Prasad, CENGAGE

WEB RESOURCES

1. https://www.researchgate.net/publication/322908864_C_Programming_Lab_Manual
2. https://www.javatpoint.com/c-programs

R23

Pragati Engineering College (Autonomous)

I Year I Semester
ENGINEERING CHEMISTRY LABORATORY
(Common to CE and MECH)

Course Category	Basic Science	**Course Code**	23BC101P
Course Type	Laboratory	**L-T-P-C**	0-0-2-1
Prerequisites		**Continuous Internal Assessment**	30
		Semester End Examination	70
		Total Marks	100

COURSE OBJECTIVES
Verify the fundamental concepts with experiments.

COURSE OUTCOMES		
Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Determine the cell constant and conductance of solutions.	K2
CO2	Prepare advanced polymer materials.	K2
CO3	Estimate the given amount of dissolved compounds in a solution by using volumetric analysis and preparation of Nano particles	K3
CO4	Estimate the Iron and Calcium in cement.	K3
CO5	Calculate the hardness of water.	K2

K1- Remembering, K2- Understanding, K3-Applying, K4- Analyzing, K5- Evaluating, K6- Creating

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

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3						2				
CO2	2	3	2					2				
CO3	2	3	3	2				2				
CO4	2	2	2	1				2				
CO5	2	2	2					2				

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List of Experiments:

1. Determination of Hardness of a ground water sample.
2. Estimation of $KMnO_4$ by using standared oxalic acid solution
3. Conductometric titration of strong acid vs. strong base
4. Preparation of a polymer (Bakelite)
5. Determination of percentage of Iron in Cement sample by colorimetry
6. P reparation of urea-formaldehyde resin
7. Preparation of nano materials by precipitation method.
8. Estimation of Ferrous Iron by Dichrometry.
9 Determination of percentage Moisture content in a coal sample
10. Determination of Viscosity of lubricating oil by Red wood Viscometer 1
11. Determination total alkalinity of given sample of water
12. Determination of Vitamin-C

Reference:

"Vogel's Quantitative Chemical Analysis 6th Edition 6th Edition" Pearson Publications by J. Mendham, R.C. Denney, J.D. Barnes and B. Sivasankar

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R23

I Year I Semester
HEALTH AND WELLNESS, YOGA AND SPORTS
(Common to CE, EEE, ME, ECE, CSE(CS) and IT)

Course Category	Humanities	**Course Code**	23MH101P
Course Type	Theory	**L-T-P-C**	0-0-1-0.5
Prerequisites		**Continuous Evaluation**	90
		Viva Voce	10
		Total Marks	100

COURSE OBJECTIVES
The main objective of introducing this course is to make the students maintain their mental and physical wellness by balancing emotions in their life. It mainly enhances the essential traits required for the development of the personality.

COURSE OUTCOMES		
Upon successful completion of the course, the student will be able to:		
CO1	Understand the importance of yoga and sports for Physical fitness and sound health.	
CO2	Demonstrate an understanding of health-related fitness components.	
CO3	Compare and contrast various activities that help enhance their health.	
CO4	Assess current personal fitness levels.	
CO5	Develop Positive Personality	

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

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1						1		1				3
CO2						1	1					3
CO3						1						3
CO4						1						3
CO5						1		1				3

COURSE CONTENT

UNIT – I

Concept of health and fitness, Nutrition and Balanced diet, basic concept of immunity Relationship between diet and fitness, Globalization and its impact on health, Body Mass Index (BMI) of all age groups.

Activities:

i) Organizing health awareness programmes in community
ii) Preparation of health profile
iii) Preparation of chart for balance diet for all age groups

UNIT – II

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Concept of yoga, need for and importance of yoga, origin and history of yoga in Indian context, classification of yoga, Physiological effects of Asanas- Pranayama and meditation, stress management and yoga, Mental health and yoga practice.

Activities:

Yoga practices Asana, Kriya, Mudra, Bandha, Dhyana, Surya Namaskar

UNIT – III

Concept of Sports and fitness, importance, fitness components, history of sports, Ancient and Modern Olympics, Asian games and Commonwealth games.

Activities:

i) Participation in one major game and one individual sport viz., Athletics, Volleyball, Basketball, Handball, Football, Badminton, Kabaddi, Kho-kho, Table tennis, Cricket etc. Practicing general and specific warm up, aerobics

ii) Practicing cardiorespiratory fitness, treadmill, run test, 9 min walk, skipping and running.

Reference Books:

1. Gordon Edlin, Eric Golanty. Health and Wellness, 14th Edn. Jones & Bartlett Learning, 2022
2. T.K.V.Desikachar. The Heart of Yoga: Developing a Personal Practice
3. Archie J.Bahm. Yoga Sutras of Patanjali, Jain Publishing Company, 1993
4. Wiseman, John Lofty, SAS Survival Handbook: The Ultimate Guide to Surviving Anywhere Third Edition, William Morrow Paperbacks, 2014
5. The Sports Rules Book/ Human Kinetics with Thomas Hanlon. -- 3rd ed. Human Kinetics, Inc.2014

General Guidelines:

1. Institutes must assign slots in the Timetable for the activities of Health/Sports/Yoga.
2. Institutes must provide field/facility and offer the minimum of five choices of as many as Games/Sports.
3. Institutes are required to provide sports instructor / yoga teacher to mentor the students.

Evaluation Guidelines:

- Evaluated for a total of 100 marks.
- A student can select 6 activities of his/her choice with a minimum of 01 activity per unit. Each activity shall be evaluated by the concerned teacher for 15 marks, totalling to 90 marks.
- A student shall be evaluated by the concerned teacher for 10 marks by conducting viva voce on the subject.

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R23

I Year II Semester
ENGINEERING PHYSICS
(Common to CE, EEE, ME, ECE, CSE(CS) and IT)

Course Category	Basic Sciences	**Course Code**	23BP201T
Course Type	Theory	**L-T-P-C**	3-0-0-3
Prerequisites	Intermediate Physics	**Continuous Internal Assessment** **Semester End Examination** **Total Marks**	30 70 100

COURSE OBJECTIVES	
1	Impart Knowledge of Physical Optics phenomena like Interference, Diffraction and Polarization required to design instruments with higher resolution.
2	Impart the knowledge of Dielectric & Magnetic materials, for engineering Applications.
3	Understand the basics of Semiconductors and their working mechanism for their utility in Engineering applications.

COURSE OUTCOMES		
Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Analyze the intensity variation of light due to polarization, interference and diffraction	K4
CO2	Familiarize with the basics of crystals and their structures.	K2
CO3	Applying the concepts of quantum mechanics for calculation of free quantum particle energies and phenomenon of electrical & thermal conductivities to sub microscopic particles	K3
CO4	Apply the basics of phenomenon related to dielectric materials and Magnetic Materials to study their dependence on temperature and frequency response.	K3
CO5	Understand the Band formation, electrical conductivities in semiconductors and study the types of semiconductors using Hall Effect.	K2

K1- Remembering, K2- Understanding, K3-Applying, K4- Analyzing, K5- Evaluating, K6- Creating

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

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

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COURSE CONTENT

UNIT - I

WAVE OPTICS

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

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

UNIT - II

CRYSTALLOGRAPHY AND X-RAY DIFFRACTION

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

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

UNIT - III

DIELECTRIC AND MAGNETIC MATERIALS

Dielectric Materials: Introduction - Dielectric polarization - Dielectric polarizability, Susceptibility, Dielectric constant and Displacement Vector – Relation between the electric vectors - Types of polarizations- Electronic (Quantitative), Ionic (Quantitative) and Orientation polarizations (Qualitative) - Lorentz internal field - Clausius- Mossotti equation - complex dielectric constant – Frequency dependence of polarization – dielectric loss

Magnetic Materials: Introduction - Magnetic dipole moment - Magnetization-Magnetic susceptibility and permeability – Atomic origin of magnetism - Classification of magnetic materials: Dia, para, Ferro, anti-ferro & Ferri magnetic materials - Domain concept for Ferromagnetism & Domain walls (Qualitative) - Hysteresis - soft and hard magnetic materials.

UNIT - IV

QUANTUM MECHANICS AND FREE ELECTRON THEORY

Quantum Mechanics: Introduction-Dual nature of matter – Heisenberg's Uncertainty Principle – Significance and properties of wave function – Schrodinger's time independent and dependent wave equations– Particle in a one-dimensional infinite potential well.

Free Electron Theory: Introduction-Classical free electron theory (Qualitative with discussion of merits and demerits) – Quantum free electron theory – electrical conductivity based on quantum free electron theory - Fermi-Dirac distribution - Density of states - Fermi energy

UNIT - V

BAND THEORY OF SOLIDS & SEMICONDUCTOR PHYSICS

BAND THEORY OF SOLIDS

Bloch's Theorem(Qualitative)-Kronig Penny Model(Qualitative)-E vs K diagram-V vs K diagram, Effective mass of electron- Classification of Crystalline Solids-Concept of hole

SEMICONDUCTOR PHYSICS

Semiconductors: Introduction-Formation of energy bands – classification of crystalline solids - Intrinsic semiconductors: Density of charge carriers – Electrical conductivity – Fermi level – Extrinsic semiconductors: density of charge carriers – dependence of Fermi energy on carrier concentration and temperature - Drift and diffusion currents – Einstein's equation – Hall effect and its applications.

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TEXT BOOKS

"A Text book of Engineering Physics"by M.N.Avadhanulu, P.G.Kshirsagar -S.Chand Publications,

"Engineering Physics" by Tirupati Naidu & Veeranjaneyalu, V G S Publishers

"Engineering Physics" by P.K Palanisamy,Sci Tech Publication

REFERENCE BOOKS

Kettles Introduction to Solid state Physics-Charles Kittel, Wiley India Edition

Solid State Physics ,AJ Dekker, I Edition, Macmillan Publishers India Private Limited

"Engineering Physics" by M.R.Srinivasan, New Age international publishers.

"Solid State Physics" by SO Pilai., - New age International Publishers

WEB RESOURCES

Web Resources: https://www.loc.gov/rr/scitech/selected-internet/physics.html

Unit I: https://nptel.ac.in/courses/122/107/122107035/#

Unit II: https://nptel.ac.in/courses/113/104/113104014/

Unit III: https://nptel.ac.in/courses/113/104/113104090/
https://youtu.be/DDLljK1ODeg

Unit IV : https://study.com/academy/lesson/the-de-broglie-hypothesis-definition-significance.html
https://nptel.ac.in/courses/115/101/115101107/
https://nptel.ac.in/courses/115/105/115105122/

Unit V : https://www.electronics-tutorials.ws/diode/diode_1.html
https://nptel.ac.in/courses/115/105/115105099/
https://nptel.ac.in/courses/108/108/108108122/

R23

Pragati Engineering College (Autonomous)

I Year II Semester
DIFFERENTIAL EQUATIONS AND VECTOR CALCULUS
(Common to All Branches)

Course Category	Basic Sciences	**Course Code**	23BM201T
Course Type	Theory	**L-T-P-C**	3-0-0-3
Prerequisites	Differentiation, Integration and Partial Differentiation. Differential Equations (Variable Separable)	**Continuous Internal Assessment** **Semester End Examination** **Total Marks**	30 70 100

COURSE OBJECTIVES	
1	To enlighten the learners in the concept of differential equations and multivariable calculus
2	To familiarize the students with the foundations of line, surface and volume integrals.

COURSE OUTCOMES		
Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Solve the first order differential equations related to various engineering fields.	K3
CO2	Solve the higher order differential equations to various engineering fields.	K3
CO3	Identify solution methods for partial differential equations that model physical processes.	K3
CO4	Interpret the physical meaning of different operators such as gradient, curl and divergence.	K3
CO5	Estimate the work done against a field, circulation and flux using vector calculus.	K3

K1- Remembering, K2- Understanding, K3-Applying, K4- Analyzing, K5- Evaluating, K6- Creating

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)												
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3	3	2	-	-	-	-	-	-	-	-	-
CO2	3	3	2	-	-	-	-	-	-	-	-	-
CO3	3	3	2	-	-	-	-	-	-	-	-	-
CO4	3	3	2	-	-	-	-	-	-	-	-	-
CO5	3	3	2	-	-	-	-	-	-	-	-	-

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COURSE CONTENT

UNIT I

Differential equations of first order and first degree:

Linear differential equations – Bernoulli's equations- Exact equations and equations reducible to exact form. **Applications**: Newton's Law of cooling – Law of natural growth and decay- Electrical circuits.

UNIT II

Linear differential equations of higher order (Constant Coefficients):

Definitions, homogenous and non-homogenous differential equations, complimentary function, particular integral, general solution, Wronskian, Method of variation of parameters. Simultaneous linear equations, Applications to L-C-R Circuit problems and Simple Harmonic motion.

UNIT III

Partial Differential Equations:

Introduction and formation of Partial Differential Equations by elimination of arbitrary constants and arbitrary functions, solutions of first order linear equations using Lagrange's method. Homogeneous Linear Partial differential equations with constant coefficients

UNIT IV

Vector differentiation:

Scalar and vector point functions, vector operator Del, Del applies to scalar point functions- Gradient and applications, Directional derivative, del applied to vector point functions- Divergence and Curl, vector identities.

UNIT V

Vector integration:

Line integral-circulation-work done by the force, Scalar potential, surface integral-flux, Green's theorem in a plane (without proof), Stoke's theorem (without proof), volume integral, Divergence theorem (without proof) and related problems.

TEXT BOOKS

1. Higher Engineering Mathematics, B. S. Grewal, Khanna Publishers, 2017, 44th Edition
2. Advanced Engineering Mathematics, Erwin Kreyszig, John Wiley & Sons, 2018, 10th Edition.

REFERENCE BOOKS

1. Thomas Calculus, George B. Thomas, Maurice D. Weir and Joel Hass, Pearson Publishers, 2018, 14th Edition.
2. Advanced Engineering Mathematics, Dennis G. Zill and Warren S. Wright, Jones and Bartlett, 2018.
3. Advanced Modern Engineering Mathematics, Glyn James, Pearson publishers, 2018, 5th Edition.
4. Advanced Engineering Mathematics, R. K. Jain and S. R. K. Iyengar, Alpha Science International Ltd., 2021 5th Edition (9th reprint)
5. Higher Engineering Mathematics, B. V. Ramana, , McGraw Hill Education, 2017

6. Advanced Engineering Mathematics by H. K Dass, S. Chand Publications, 2022, 22nd Edition (Reprint 2022).

WEB RESOURCES

1. https://mathworld.wolfram.com/First-OrderOrdinaryDifferentialEquation.html
2. https://en.wikipedia.org/wiki/Differential_equation
3. https://en.wikipedia.org/wiki/Partial_differential_equation
4. https://en.wikipedia.org/wiki/Vector_calculus
5. https://en.wikipedia.org/wiki/Vector_calculus

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R23

I Year II Semester
BASIC ELECTRICAL AND ELECTRONICS ENGINEERING
(Common to CE, EEE, ME, ECE, CSE(CS) and IT)

Course Category	Engineering Science	**Course Code**	23EE201T
Course Type	Theory	**L-T-P-C**	3-0-0-3
Prerequisites		**Continuous Internal Assessment** **Semester End Examination** **Total Marks**	30 70 100

PART-A :BASIC ELECTRICAL ENGINEERING

COURSE OBJECTIVES
To expose to the field of electrical & electronics engineering, laws and principles of electrical/ electronic engineering and to acquire fundamental knowledge in the relevant field.

COURSE OUTCOMES		
Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Know the fundamental laws, operating principles of motors, generators, MC and MI instruments	K2
CO2	Apply the problem solving concepts associated to AC and DC circuits, construction and operation of AC and DC machines, measuring instruments; different power generation mechanisms, Electricity billing concept and important safety measures related to electrical operations.	K3
CO3	Apply the mathematical tools and fundamental concepts to derive various equations related to machines, circuits and measuring instruments; electricity bill calculations and layout representation of electrical power systems.	K3

K1- Remembering, K2- Understanding, K3-Applying, K4- Analyzing, K5- Evaluating, K6- Creating

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

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

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COURSE CONTENT

UNIT I

DC Circuits: Electrical circuit elements (R, L and C), Ohm's Law and its limitations, KCL & KVL, series, parallel, series-parallel circuits, Super Position theorem, Simple numerical problems.

AC Circuits: A.C. Fundamentals: Equation of AC Voltage and current, waveform, time period, frequency, amplitude, phase, phase difference, average value, RMS value, form factor, peak factor, Voltage and current relationship with phasor diagrams in R, L, and C circuits, Concept of Impedance, Active power, reactive power and apparent power, Concept of power factor (Simple Numerical problems).

UNIT II

Machines and Measuring Instruments

Machines: Construction, principle and operation of (i) DC Motor, (ii) DC Generator, (iii) Single Phase Transformer, (iv) Three Phase Induction Motor and (v) Alternator, Applications of electrical machines.

Measuring Instruments: Construction and working principle of Permanent Magnet Moving Coil (PMMC), Moving Iron (MI) Instruments and Wheat Stone bridge.

UNIT III

Energy Resources, Electricity Bill & Safety Measures

Energy Resources: Conventional and non-conventional energy resources; Layout and operation of various Power Generation systems: Hydel, Nuclear, Solar & Wind power generation.

Electricity bill: Power rating of household appliances including air conditioners, PCs, Laptops, Printers, etc. Definition of "unit" used for consumption of electrical energy, two-part electricity tariff, calculation of electricity bill for domestic consumers.

Equipment Safety Measures: Working principle of Fuse and Miniature circuit breaker (MCB), merits and demerits. Personal safety measures: Electric Shock, Earthing and its types, Safety Precautions to avoid shock.

Textbooks:

1. Basic Electrical Engineering, D. C. Kulshreshtha, Tata McGraw Hill, 2019, First Edition

2. Power System Engineering, P.V. Gupta, M.L. Soni, U.S. Bhatnagar and A. Chakrabarti, DhanpatRai& Co, 2013

3. Fundamentals of Electrical Engineering, Rajendra Prasad, PHI publishers, 2014, Third Edition

Reference Books:

1. Basic Electrical Engineering, D. P. Kothari and I. J. Nagrath, McGraw Hill, 2019, Fourth Edition

2. Principles of Power Systems, V.K. Mehtha, S.Chand Technical Publishers, 2020

3. Basic Electrical Engineering, T. K. Nagsarkar and M. S. Sukhija, Oxford University Press, 2017

4. Basic Electrical and Electronics Engineering, S. K. Bhatacharya, Person Publications, 2018, Second Edition.

Web Resources:

1. https://nptel.ac.in/courses/108105053
2. https://nptel.ac.in/courses/108108076

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PART-B : BASIC ELECTRONICS ENGINEERING

COURSE OBJECTIVES	
1	To impart knowledge on semiconductor devices.
2	To introduce concepts of biasing and applications of diodes and transistors.
3	To introduce fundamentals of digital electronics.

COURSE OUTCOMES		
Upon successful completion of the course, the student will be able to:		Cognitive Level
CO1	Understand the basic concepts of diodes and transistors	K2
CO2	Understand the working principles of semiconductor devices and applications	K2
CO3	Understand number system, Boolean algebra, basics of combinational and sequential circuits	K2

K1- Remembering, K2- Understanding, K3-Applying, K4- Analyzing, K5- Evaluating, K6- Creating

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

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2										
CO2	2	2										
CO3	2	2										

COURSE CONTENT

UNIT - I

SEMICONDUCTOR DEVICES

Introduction - Evolution of electronics – Vacuum tubes to nano electronics - Characteristics of PN Junction Diode — Zener Effect — Zener Diode and its Characteristics. Bipolar Junction Transistor — CB, CE, CC Configurations and Characteristics — Elementary Treatment of Small Signal CE Amplifier.

UNIT - II

BASIC ELECTRONIC CIRCUITS AND INSTRUMENTTAION

Rectifiers and power supplies: Block diagram description of a dc power supply, working of a full wave bridge rectifier, capacitor filter (no analysis), working of simple zener voltage regulator. Amplifiers: Block diagram of Public Address system, Block diagram and working of common emitter (RC coupled) amplifier with its frequency response. Electronic Instrumentation: Block diagram of an electronic instrumentation system.

UNIT - III

DIGITAL ELECTRONICS

Overview of Number Systems, BCD codes, Functionality of Logic Gates – NOT, OR, AND, NOR, NAND, XORand XNOR. Excess-3 code, Gray code, Hamming code. Boolean Algebra, Basic Theorems and properties of Boolean Algebra, Truth Tables and Simple combinational circuits–Half and Full Adders. Introduction to sequential circuits, Flip flops, Registers and counters (Elementary Treatment only)

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Textbooks:

1. Robert. L. Boylestad & Louis Nashelsky, Electronic Devices & Circuit Theory, Pearson Education, 2021.
2. Digital Design by Morris Mano, 3E, Prentice Hall, India, 2001

Reference Books:

1. R. S. Sedha, A Textbook of Electronic Devices and Circuits, S. Chand & Co, 2010.
2. Santiram Kal, Basic Electronics- Devices, Circuits and IT Fundamentals, Prentice Hall, India, 2002.
3. R. T. Paynter, Introductory Electronic Devices & Circuits – Conventional Flow Version, Pearson Education, 2009.

Web References:

1. NPTEL- https://archive.nptel.ac.in/courses/108/108/108108122/
2. Neso Academy- https://www.nesoacademy.org/ec/05-digital-electronics

R23

Pragati Engineering College (Autonomous)

I Year II Semester
ENGINEERING GRAPHICS
(Common to CE, EEE, ME, ECE, CSE(CS) and IT)

Course Category	Engineering Science	**Course Code**	23ME201T
Course Type	Theory	**L-T-P-C**	1-0-4-3
Prerequisites		**Continuous Internal Assessment**	30
		Semester End Examination	70
		Total Marks	100

COURSE OBJECTIVES	
1	To enable the students with various concepts like dimensioning, conventions and standards related to Engineering Drawing.
2	To impart knowledge on the projection of points, lines and plane surfaces.
3	To improve the visualization skills for better understanding of projection of solids.
4	To develop the imaginative skills of the students required to understand Section of solids and Developments of surfaces.
5	To make the students understand the viewing perception of a solid object in Isometric and Perspective projections.

COURSE OUTCOMES		
Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Understand the principles of engineering drawing, including engineering curves, scales, orthographic and isometric projections.	K2
CO2	Draw and interpret orthographic projections of points, lines, planes and solids in front, top and side views.	K3
CO3	Understand and draw projection of solids in various positions in first quadrant.	K3
CO4	Explain principles behind development of surfaces.	K2
CO5	Prepare isometric and perspective sections of simple solids.	K3

K1- Remembering, K2- Understanding, K3-Applying, K4- Analyzing, K5- Evaluating, K6- Creating

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

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

COURSE CONTENT

UNIT - I

Introduction: Lines, Lettering and Dimensioning, Geometrical Constructions and Constructing regular polygons by general methods.

Curves: construction of ellipse, parabola and hyperbola by general, Cycloids, Involutes, Normal and tangent to Curves.

Scales: Plain scales, diagonal scales and vernier scales.

UNIT - II

Orthographic Projections: Reference plane, importance of reference lines or Plane, Projections of a point situated in any one of the four quadrants.

Projections of Straight Lines: Projections of straight lines parallel to both reference planes, perpendicular to one reference plane and parallel to other reference plane, inclined to one reference plane and parallel to the other reference plane. Projections of Straight Line Inclined to both the reference planes

Projections of Planes: regular planes Perpendicular to both reference planes, parallel to one reference plane and inclined to the other reference plane; plane inclined to both the reference planes.

UNIT - III

Projections of Solids: Types of solids: Polyhedral and Solids of revolution. Projections of solids in simple positions: Axis perpendicular to horizontal plane, Axis perpendicular to vertical plane and Axis parallel to both the reference planes, Projection of Solids with axis inclined to one reference plane and parallel to another plane.

UNIT - IV

Sections of Solids: Perpendicular and inclined section planes, Sectional views and True shape of section, Sections of solids in simple position only.

Development of Surfaces: Methods of Development: Parallel line development and radial line development. Development of a cube, prism, cylinder, pyramid and cone.

UNIT - V

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

Computer graphics: Creating 2D&3D drawings of objects including PCB and Transformations using Auto CAD (*Not for end examination*).

Textbook:

1. N. D. Bhatt, Engineering Drawing, Charotar Publishing House, 2016.

Reference Books:

1. Engineering Drawing, K.L. Narayana and P. Kannaiah, Tata McGraw Hill, 2013.
2. Engineering Drawing, M.B.Shah and B.C. Rana, Pearson Education Inc,2009.
3. Engineering Drawing with an Introduction to AutoCAD, Dhananjay Jolhe, Tata McGraw Hill, 2017.

Web References:

1. http://nptel.ac.in/courses/112103019/
2. https://www.cadtutor.net/tutorials/autocad/

Pragati Engineering College (Autonomous)

R23

I Year II Semester
ENGINEERING MECHANICS
(Common to CE and ME)

Course Category	Professional Core	**Course Code**	23ME202T
Course Type	Theory	**L-T-P-C**	3-0-0-3
Prerequisites		**Continuous Internal Assessment**	30
		Semester End Examination	70
		Total Marks	100

COURSE OBJECTIVES	
1	To get familiarized with different types of force systems.
2	To draw accurate free body diagrams representing forces and moments acting on a body to analyze the equilibrium of system of forces.
3	To teach the basic principles of center of gravity, centroid and moment of inertia and determine them for different simple and composite bodies.
4	To apply the Work-Energy method to particle motion.
5	To understand the kinematics and kinetics of translational and rotational motion of rigid bodies.

COURSE OUTCOMES		
Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Understand the fundamental concepts in mechanics and determine the frictional forces for bodies in contact.	K2
CO2	Analyze different force systems such as concurrent, coplanar and spatial systems and calculate their resultant forces and moments.	K4
CO3	Calculate the centroids, center of gravity and moment of inertia of different geometrical shapes.	K3
CO4	Apply the principles of work-energy and impulse-momentum to solve the problems of rectilinear and curvilinear motion of a particle.	K3
CO5	Solve the problems involving the translational and rotational motion of rigid bodies.	K3

K1- Remembering, K2- Understanding, K3-Applying, K4- Analyzing, K5- Evaluating, K6- Creating

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

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

COURSE CONTENT

UNIT I

Introduction to Engineering Mechanics– Basic Concepts. Scope and Applications

Systems of Forces: Coplanar Concurrent Forces– Components in Space–Resultant–Moment of Force and its Application –Couples and Resultant of Force Systems.

Friction: Introduction**,** limiting friction and impending motion, Coulomb's laws of dry friction, coefficient of friction, Cone of Static friction. Introduction to Wedges.

UNIT II

Equilibrium of Systems of Forces: Free Body Diagrams, Lami's Theorem, Equations of Equilibrium of Coplanar Systems, Graphical method for the equilibrium, Triangle law of forces, converse of the law of polygon of forces condition of equilibrium, Equations of Equilibrium for Spatial System of forces, Numerical examples on spatial system of forces using vector approach, Analysis of plane trusses. Principle of virtual work with simple examples

UNIT III

Centroid: Centroids of simple figures (from basic principles)–Centroids of Composite Figures.

Centre of Gravity: Centre of gravity of simple body (from basic principles), Centre of gravity of composite bodies, Pappus theorems.

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

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

UNIT IV

Rectilinear and Curvilinear motion of a particle: Kinematics and Kinetics –D'Alembert's Principle - Work Energy method and applications to particle motion-Impulse Momentum method.

UNIT V

Rigid body Motion: Kinematics and Kinetics of translation, Rotation about fixed axis and plane motion, Work Energy method and Impulse Momentum method.

Textbooks:

1.Engineering Mechanics, S. Timoshenko, D. H. Young, J.V. Rao, S. Pati., McGraw Hill Education 2017. 5th Edition.

2. Engineering Mechanics, P.C.Dumir- S.Sengupta and Srinivas V veeravalli , University press. 2020. First Edition.

3. A Textbook of Engineering Mechanics, S.S Bhavikatti. New age international publications 2018. 4th Edition.

Reference Books:

1. Engineering Mechanics, Statics and Dynamics, Rogers and M A. Nelson., McGraw Hill Education. 2017. First Edition.

2. Engineering Mechanics, Statics and Dynamics, I.H. Shames., PHI, 2002. 4th Edition.

3. Engineering Mechanics, Volume-I: Statics, Volume-II: Dynamics, J. L. Meriam and L. G. Kraige., John Wiley, 2008. 6th Edition.

4. Introduction to Statics and Dynamics, Basudev Battachatia, Oxford University Press, 2014. Second Edition

5. Engineering Mechanics: Statics and Dynamics, Hibbeler R.C., Pearson Education, Inc., New Delhi, 2022, 14th Edition.

Web References:

1. http://nptel.ac.in/courses/122104015/
2. https://freevideolectures.com/course/2264/engineering-mechanics
3. https://ocw.mit.edu/courses/1-050-engineering-mechanics-i-fall-2007/

Pragati Engineering College (Autonomous)

R23

I Year II Semester
ENGINEERING PHYSICS LABORATORY
(Common to CE, EEE, ME, ECE, CSE(CS) and IT)

Course Category	Basic Sciences	**Course Code**	23BP201P
Course Type	Laboratory	**L-T-P-C**	0-0-2-1
Prerequisites	Intermediate Physics	**Continuous Internal Assessment** **Semester End Examination** **Total Marks**	30 70 100

COURSE OBJECTIVES	
1	The student will have exposure to various experimental skills which is essential for an Engineering student.
2	To gain practical knowledge by applying the experimental methods to correlate with the Theoretical Physics.
3	Apply the Analytical techniques and graphical analysis to the experimental data

COURSE OUTCOMES		
Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Understand the basics of Interference, Diffraction in Physics using instruments like Spectrometer, Travelling microscope.	K2
CO2	Study the Mechanical Laws, Strength of materials, Magnetic and Dielectric constants of materials.	K3
CO3	Apply the basics of Current Electricity and Semiconductors in engineering application	K3

K1- Remembering, K2- Understanding, K3-Applying, K4- Analyzing, K5- Evaluating, K6- Creating

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

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	-	-	-	-	-	-	-	-	-	-	-
CO2	2	-	-	-	-	-	-	-	-	-	-	-
CO3	2	2	2	-	-	-	-	-	-	-	-	-

COURSE CONTENT (Any TEN of the listed experiments are to be conducted. Out of which any TWO experiments may be conducted in virtual mode).

1. Determination of radius of curvature of a given Plano-convex lens by Newton's Rings.
2. Determination of wavelengths of different spectral lines in mercury spectrum using diffraction grating in normal incidence configuration.
3. Verification of Brewster's law
4. Determination of wavelength of Laser light using diffraction grating.
5. Estimation of Planck's constant using photoelectric effect.
6. Sonometer: Verification of laws of stretched string.
7. Determination of young's modulus for the given material of wooden scale by non- uniform bending

(or double cantilever) method.

8. Determination of rigidity modulus of the material of the given wire using Torsional pendulum
9. Determination of acceleration due to gravity and radius of Gyration by using a compound pendulum.
10. Determination of magnetic susceptibility by Kundt's tube method.
11. Magnetic field along the axis of a current carrying circular coil by Stewart Gee's Method.
12. Study the variation of B versus H by magnetizing the magnetic material (B-H curve).
13. Determination of dielectric constant using charging and discharging method.
14. Determination of the resistivity of semiconductors by four probe methods.
15. Determination of energy gap of a semiconductor using p-n junction diode.
16. Determination of temperature coefficients of a thermistor.
17. Determination of Hall voltage and Hall coefficient of a given semiconductor using Hall effect.

TEXT BOOKS

College Customized Manual

REFERENCE BOOKS

A Textbook of Practical Physics - S. Balasubramanian, M.N. Srinivasan, S. Chand Publishers, 2017

WEB RESOURCES

1. https://phet.colorado.edu/en/simulations/filter?subjects=physics&type=html,prototype
2. www.vlab.co.in

R23

Pragati Engineering College (Autonomous)

I Year II Semester
ELECTRICAL AND ELECTRONICS ENGINEERING WORKSHOP
(Common to CE, EEE, ME, ECE, CSE(CS) and IT)

Course Category	Engineering Science	**Course Code**	23EE201P
Course Type	Laboratory	**L-T-P-C**	0-0-3-1.5
Prerequisites		**Continuous Internal Assessment**	30
		Semester End Examination	70
		Total Marks	100

PART-A: ELECTRICAL ENGINEERING WORKSHOP

COURSE OBJECTIVES
To impart knowledge on the fundamental laws & theorems of electrical circuits, functions of electrical machines and energy calculations.

COURSE OUTCOMES		
Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Know the Electrical circuit design concepts; measurement of resistance, power, power factor; concept of wiring and operation of Electrical Machines and Transformer.	K2
CO2	Apply the theoretical concepts and operating principles to derive mathematical models for circuits, Electrical machines and measuring instruments; calculations for the measurement of resistance, power and power factor.	K3
CO3	Apply the theoretical concepts to obtain calculations for the measurement of resistance, power and power factor.	K3
CO4	Analyse various characteristics of electrical circuits, electrical machines and measuring instruments.	K4
CO5	Design suitable circuits and methodologies for the measurement of various electrical parameters; Household and commercial wiring.	K4

K1- Remembering, K2- Understanding, K3-Applying, K4- Analyzing, K5- Evaluating, K6- Creating

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)												
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	2	2	2	-	1	-	-	-	1	-	-	-
CO2	2	2	2	-	1	-	-	-	1	-	-	-
CO3	2	2	1	-	1	-	-	-	1	-	-	-
CO4	2	2	-	-	1	-	-	-	1	-	-	-
CO5	-	-	-	-	1	1	1	-	1	-	-	-

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List of experiments:

1. Verification of KCL and KVL
2. Verification of Superposition theorem
3. Measurement of Resistance using Wheat stone bridge
4. Measurement of Three- phase power in Three-phase induction motor using two wattmeter method.
5. Speed control of DC shunt motor.
6. Measurement of Power and Power factor using Single-phase wattmeter
7. Measurement of Earth Resistance using Megger
8. Calculation of Electrical Energy for Domestic Premises

Reference Books:

1. Basic Electrical Engineering, D. C. Kulshreshtha, Tata McGraw Hill, 2019, First Edition
2. Power System Engineering, P.V. Gupta, M.L. Soni, U.S. Bhatnagar and A. Chakrabarti, DhanpatRai& Co, 2013
3. Fundamentals of Electrical Engineering, Rajendra Prasad, PHI publishers, 2014, Third Edition

Note: Minimum Six Experiments to be performed.

PART B: ELECTRONICS ENGINEERING WORKSHOP

COURSE OBJECTIVES
To impart knowledge on the principles of digital electronics and fundamentals ofelectron devices & its applications.

COURSE OUTCOMES		
Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO6	Identify & testing of various electronic components.	K3
CO7	Understand the usage of electronic measuring instruments.	K3
CO8	Plot and discuss the characteristics of various electron devices.	K3
CO9	Explain the operation of a digital circuit.	K3

K1- Remembering, K2- Understanding, K3-Applying, K4- Analyzing, K5- Evaluating, K6- Creating

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)												
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO6	2	2		2	2							
CO7	2	2		2	2							
CO8	2	2		2	2							
CO9	2	2		2	2							

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List of experiments:

1. Introduction to Active and Passive devices must be experiment-1 (includes Resistors, Capacitors, Inductors, Diodes, Transistors, Power supplies, Ammeter(s), Voltmeter(s), necessary devices)
2. Plot V-I characteristics of PN Junction diode A) Forward bias B) Reverse bias.
3. Plot V – I characteristics of Zener Diode and its application as voltage Regulator.
4. Determine ripple factor of full wave rectifier.
5. Plot Input & Output characteristics of BJT in CE and CB configurations.
6. Determining CE Amplifier input and output impedance with and without bypass capacitor.
7. Verification of Truth Table of AND, OR, NOT, NAND, NOR, Ex-OR, Ex-NOR gates using ICs.
8. Verification of Truth Tables of S-R, J-K& D flip flops using respective ICs.

Tools / Equipment Required: DC Power supplies, Multi meters, DC Ammeters, DC Voltmeters, AC Voltmeters, CROs, all the required active devices. Multisim/PSPICE software for Simulation.

References:

1. Robert. L. Boylestad & Louis Nashelsky, Electronic Devices & Circuit Theory, PearsonEducation, 2021.
2. R. P. Jain, Modern Digital Electronics, 4th Edition, Tata Mc Graw Hill, 2009
3. R. T. Paynter, Introductory Electronic Devices & Circuits – Conventional Flow Version, Pearson Education,2009.

Note: Minimum Six Experiments to be performed. All the experiments shall be implemented using both Hardware and Software.

R23

Pragati Engineering College (Autonomous)

I Year II Semester
ENGINEERING MECHANICS AND BUILDING PRACTICES LABORATORY
(CE)

Course Category	Professional Core	**Course Code**	23CE201P
Course Type	Laboratory	**L-T-P-C**	0-0-3-1.5
Prerequisites		**Continuous Internal Assessment**	30
		Semester End Examination	70
		Total Marks	100

COURSE OBJECTIVES	
1	Verify the Law of Parallelogram of Forces and Lami's theorem.
2	Determine the coefficients of friction of Static and Rolling friction and Centre of gravity of fferent plane Lamina
3	Understand the layout of a building, concepts of Non-Destructive Testing and different Alternative Materials.

COURSE OUTCOMES		
Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Find the coefficient of friction between two different surfaces and between the inclined plane and the roller.	K3
CO2	validate Parallelogram Law of forces and Law of Moment using force polygon and bell crank lever.	K3
CO3	find the Centre of gravity of different shaped Plane Lamina	K3
CO4	Get acquainted with various alternative materials used as partial substitutes for natural ingredients of concrete	K3
CO5	Learn about various tools and safety practices in the construction industry.	K2

K1- Remembering, K2- Understanding, K3-Applying, K4- Analyzing, K5- Evaluating, K6- Creating

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

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

COURSE CONTENT

Students have to perform any 10 of the following Experiments:

1. To study various types of tools used in construction.
2. Forces in Pin Jointed Trusses
3. Experimental Proof of Lami's Theorem
4. Verification of Law of Parallelogram of Forces.
5. Determination of Center of Gravity of different shaped Plane Lamina.
6. Determination of coefficient of Static and Rolling Friction.
7. Verification of Law of Moment using Rotation Disc Apparatus and Bell Crank Lever.
8. Study of Alternative Materials like M-sand, Fly ash, Sea Sand etc.
9. Field-Visit to understand the Quality Testing - report.
10. Safety Practices in Construction industry
11. Study of Plumbing in buildings.

References:

1. S. Timoshenko, D. H. Young, J.V. Rao, S. Pati., Engineering Mechanics, 5th Edition, McGraw Hill Education.
2. Hibbeler R.C., Engineering Mechanics: Statics and Dynamics, 14th Edition, Pearson Education, Inc., New Delhi, 2022.
3. Concrete Technology, Theory and Practice, 8e, by M. S. Shetty – S. Chand & Co.
4. Varghese. P.C, Building Construction, Second Edition PHI Learning ltd., 2016.
5. Elements of Environmental Engineering by K.N. Duggal, S. Chand & Company Ltd. New Delhi, 3 rd Edition 1996.

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R23

I Year II Semester
IT WORKSHOP
(Common to CE, EEE, ME, ECE, CSE(CS) and IT)

Course Category	Engineering Science	**Course Code**	23IT201P
Course Type	Laboratory	**L-T-P-C**	0-0-2-1
Prerequisites		**Continuous Internal Assessment**	30
		Semester End Examination	70
		Total Marks	100

COURSE OBJECTIVES

1. To introduce the internal parts of a computer, peripherals, I/O ports, connecting cables.
2. To demonstrate configuring the system as Dual boot both Windows and other Operating Systems Viz. Linux, BOSS.
3. To teach basic command line interface commands on Linux.
4. To teach the usage of Internet for productivity and self-paced life-long learning.
5. To introduce Compression, Multimedia and Antivirus tools and Office Tools such as Word processors, Spread sheets and Presentation tools.

COURSE OUTCOMES

Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Perform Hardware troubleshooting.	K3
CO2	Understand Hardware components and inter dependencies.	K3
CO3	Safeguard computer systems from viruses/worms.	K3
CO4	Document/ Presentation preparation.	K3
CO5	Perform calculations using spreadsheets.	K3

K1- Remembering, K2- Understanding, K3-Applying, K4- Analyzing, K5- Evaluating, K6- Creating

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

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

COURSE CONTENT

PC Hardware & Software Installation

Task 1: Identify the peripherals of a computer, components in a CPU and its functions. Draw the block diagram of the CPU along with the configuration of each peripheral and submit to your instructor.

Task 2: Every student should disassemble and assemble the PC back to working condition. Lab instructors should verify the work and follow it up with a Viva. Also students need to go through the video which shows the process of assembling a PC. A video would be given as part of the course content.

Task 3: Every student should individually install MS windows, Linux / BOSS on the personal computer. This computer should have windows installed. The system should be configured as dual boot (VMWare) with both Windows and Linux / BOSS Lab instructor should verify the installation and follow it up with a Viva.

Internet & World Wide Web

Task1: Orientation & Connectivity Boot Camp: Students should get connected to their Local Area Network and access the Internet. In the process they configure the TCP/IP setting. Finally students should demonstrate, to the instructor, how to access the websites and email. If there is no internet connectivity preparations need to be made by the instructors to simulate the WWW on the LAN.

Task 2: Web Browsers, Surfing the Web: Students customize their web browsers with the LAN proxy settings, bookmarks, search toolbars and pop up blockers. Also, plug-ins like Macromedia Flash and JRE for applets should be configured.

Task 3: Search Engines & Netiquette: Students should know what search engines are and howto use the search engines. A few topics would be given to the students for which they need to search on Google. This should be demonstrated to the instructors by the student.

Task 4: Cyber Hygiene: Students would be exposed to the various threats on the internet and would be asked to configure their computer to be safe on the internet. They need to customize their browsers to block pop ups, block active x downloads to avoid viruses and/or worms.

WORD

Task 1 – Word Orientation: The mentor needs to give an overview of Microsoft (MS) office or equivalent (FOSS) tool word: Importance of MS office or equivalent(FOSS) tool Word as word Processors, Details of the four tasks and features that would be covered in each, Using word – Accessing, overview of toolbars, saving files, Usinghelp and resources, rulers, format painter in word.

Task 2: Using Word to create a project certificate. Features to be covered:- Formatting Fonts in word, Drop Cap in word, Applying Text effects, Using Character Spacing, Borders and Colors, Inserting Header and Footer, Using Date and Time option in Word.

Task 3: Creating project abstract Features to be covered:-Formatting Styles, Inserting table, Bullets and Numbering, Changing Text Direction, Cell alignment, Footnote, Hyperlink, Symbols, Spell Check, Track Changes.

Task 4: Creating a Newsletter: Features to be covered:- Table of Content, Newspaper columns, Images from files and clipart, Drawing toolbar and Word Art, Formatting Images, Textboxes, Paragraphs and Mail Merge in word.

EXCEL

Excel Orientation: The mentor needs to tell the importance of MS office or equivalent (FOSS) tool Excel as a Spreadsheet tool, give the details of the four tasks and features that would be covered in each. Using Excel – Accessing, overview of toolbars, saving excel files, Using help and resources.

Task 1: Creating a Scheduler - Features to be covered: Gridlines, Format Cells, Summation, auto fill, Formatting Text.

Task 2: Calculating GPA -. Features to be covered:- Cell Referencing, Formulae in excel – average, std. deviation, Charts, Renaming and Inserting worksheets, Hyper linking, Count function.

POWER POINT

Task 1: Students will be working on basic power point utilities and tools which help them create basic power point presentations. PPT Orientation, Slide Layouts, Inserting Text, Word Art, Formatting Text, Bullets and Numbering, Auto Shapes, Lines and Arrows in PowerPoint.

Task 2: Interactive presentations - Hyperlinks, Inserting –Images, Clip Art, Audio, Video, Objects, Tables and Charts.

Task 3: Master Layouts (slide, template, and notes), Types of views (basic, presentation, slide slotter, notes etc), and Inserting – Background, textures, Design Templates, Hidden slides.

AI TOOLS – ChatGPT

Task 1: Prompt Engineering: Experiment with different types of prompts to see how the model responds. Try asking questions, starting conversations, or even providing incomplete sentencesto see how the model completes them.

- Ex: Prompt: "You are a knowledgeable AI. Please answer the following question: Whatis the capital of France?"

Task 2: Creative Writing: Use the model as a writing assistant. Provide the beginning of a story or a description of a scene, and let the model generate the rest of the content. This can be a fun way to brainstorm creative ideas

- Ex: Prompt: "In a world where gravity suddenly stopped working, people started floating upwards. Write a story about how society adapted to this new reality."

Task 3: Language Translation: Experiment with translation tasks by providing a sentence in one language and asking the model to translate it into another language. Compare the output to see how accurate and fluent the translations are.

- Ex: Prompt: "Translate the following English sentence to French: 'Hello, how are you doing today?'"

Reference Books:

1. Comdex Information Technology course tool kit, Vikas Gupta, WILEY Dream tech, 2--3.
2. The Complete Computer upgrade and repair book, Cheryl A Schmidt, WILEY Dream tech, 2-13, 3rd edition.
3. Introduction to Information Technology, ITL Education Solutions limited, Pearson Education, 2-12, 2nd edition.
4. PC Hardware - A Handbook, Kate J. Chase, PHI (Microsoft).
5. IT Essentials PC Hardware and Software Companion Guide, David Anfins on and Ken Quamme. – CISCO Press, Pearson Education, 3rd edition.
6. IT Essentials PC Hardware and Software Labs and Study Guide, Patrick Regan– CISCO Press, Pearson Education, 3rd edition.

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Web References:

1. PC Hardware & Software Installation:
   Peripheral Devices: Computer Peripherals - Wikipedia
   Components in a CPU: CPU Components and Their Functions - Guru99
2. Internet & World Wide Web:
   TCP/IP and Networking Basics: TCP/IP Explained - Lifewire
   Internet Browsing and Configuration: How Web Browsing Works - HowStuffWorks
3. Word:
   Microsoft Word Tutorials: Microsoft Word Basics - GCFGlobal
4. Excel:
   Excel Tutorial and Functions: Excel Tutorial - Microsoft
5. AI Tools - ChatGPT:
   GPT-3.5 and ChatGPT Information: GPT-3.5 Guide - OpenAI

Pragati Engineering College (Autonomous)

R23

I Year II Semester
NSS/NCC/SCOUTS AND GUIDES/COMMUNITY SERVICE
(Common to CE, EEE, ME, ECE, CSE(CS) and IT)

Course Category	Humanities	**Course Code**	23MH202P
Course Type	Theory	**L-T-P-C**	0-0-1-0.5
Prerequisites		**Continuous Evaluation**	90
		Viva Voce	10
		Total Marks	100

COURSE OBJECTIVES
The objective of introducing this course is to impart discipline, character, fraternity, teamwork, social consciousness among the students and engaging them in selfless service.

COURSE OUTCOMES		
Upon successful completion of the course, the student will be able to:		
CO1	Understand the importance of discipline, character and service motto.	
CO2	Solve some societal issues by applying acquired knowledge, facts, and techniques.	
CO3	Explore human relationships by analyzing social problems.	
CO4	Determine to extend their help for the fellow beings and downtrodden people.	
CO5	Develop leadership skills and civic responsibilities.	

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

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1						3		1	1			3
CO2						3		1				3
CO3						3			1	1		3
CO4						3		1				3
CO5						3	3	1	1	1		3

COURSE CONTENT

UNIT – I: Orientation

General Orientation on NSS/NCC/ Scouts & Guides/Community Service activities, career guidance.

Activities:

i) Conducting ice breaking sessions-expectations from the course-knowing personal talents and skills
ii) Conducting orientations programs for the students future plans-activities-releasing road map etc.
iii) Displaying success stories-motivational biopics- award winning movies on societal issues etc.
iv) Conducting talent show in singing patriotic songs-paintings- any other contribution.

UNIT – II: Nature & Care

Activities:

i) Best out of waste competition.
ii) Poster and signs making competition to spread environmental awareness.
iii) Recycling and environmental pollution article writing competition.
iv) Organising Zero-waste day.
v) Digital Environmental awareness activity via various social media platforms.
vi) Virtual demonstration of different eco-friendly approaches for sustainable living.
vii) Write a summary on any book related to environmental issues.

UNIT – III: Community Service

Activities:

i) Conducting One Day Special Camp in a village contacting village-area leaders- Survey in the village, identification of problems- helping them to solve via media- authorities- experts-etc.
ii) Conducting awareness programs on Health-related issues such as General Health, Mental health, Spiritual Health, HIV/AIDS,
iii) Conducting consumer Awareness. Explaining various legal provisions etc.
iv) Women Empowerment Programmes- Sexual Abuse, Adolescent Health and Population Education.
v) Any other programmes in collaboration with local charities, NGOs etc.

Reference Books:

1. Nirmalya Kumar Sinha & Surajit Majumder, A Text Book of National Service Scheme Vol;.I, Vidya Kutir Publication, 2021 (ISBN 978-81-952368-8-6)
2. Red Book - National Cadet Corps Standing Instructions Vol I & II, Directorate General of NCC, Ministry of Defence, New Delhi
3. Davis M. L. and cornwell D. A., "Introduction to Environmental Engineering", McGraw Hill, New York 4/e 2008
4. Masters G. M. Joseph K. and Nagendran R. "Introduction to Environmental Engineering and Science", Pearson Education, New Delhi. 2/e 2007
5. Ram Ahuja. Social Problems in India, Rawat Publications, New Delhi.

General Guidelines:

1. Institutes must assign slots in the Timetable for the activities.
2. Institutes are required to provide instructor to mentor the students.

Evaluation Guidelines:

- Evaluated for a total of 100 marks.
- A student can select 6 activities of his/her choice with a minimum of 01 activity per unit. Each activity shall be evaluated by the concerned teacher for 15 marks, totalling to 90 marks.
- A student shall be evaluated by the concerned teacher for 10 marks by conducting viva voce on the subject.

PRAGATI ENGINEERING COLLEGE: SURAMPALEM
(Autonomous)
Department of Civil Engineering

R23

II Year I Semester
Numerical Techniques and Statistical Methods
(CIVIL)

Course Category	Basic Sciences	**Course Code**	23BM301T
Course Type	Theory	**L-T-P-C**	3-0-0-3
Prerequisites	Differentiation & integration, Permutations & combinations, Elementary Probability	**Continuous Internal Assessment** **Semester End Examination** **Total Marks**	30 70 100

COURSE OBJECTIVES	
1	To elucidate the different numerical methods to solve non linear algebraic equations
2	To disseminate the use of different numerical techniques for carrying out numerical integration.
3	To familiarize the students with the foundations of probability and statistical methods.
4	To equip the students to solve application problems in their disciplines

COURSE OUTCOMES		
Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Evaluate the approximate roots of polynomial and transcendental equations by different algorithms. Apply Newton's forward & backward interpolation and Lagrange's formulae for equal and unequal intervals	K3
CO2	Apply numerical integral techniques to different Engineering problems. Apply different algorithms for approximating the solutions of ordinary differential equations with initial conditions to its analytical computations	K3
CO3	Apply discrete and continuous probability distributions	K3
CO4	Design the components of a classical hypothesis test	K3
CO5	Infer the statistical inferential methods based on small and large sampling tests	K3

K1- Remembering, K2- Understanding, K3-Applying, K4- Analyzing, K5- Evaluating, K6- Creating

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

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

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COURSE CONTENT

UNIT I

Iterative Methods:

Introduction – Solutions of algebraic and transcendental equations : Bisection method–Secant method –Method of false position–Iteration method–Newton-Raphson method (One variable and simultaneous Equations)

Interpolation : Newton's forward and backward formulae for interpolation–Interpolation with unequal intervals – Lagrange's interpolation formula

UNIT II

Numerical integration, Solution of ordinary differential equations with initial conditions:

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

UNIT III

Probability and Distributions:

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

UNIT IV

Sampling Theory:

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

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 – Test of significance for large samples and Small Samples: Single and difference means – Single and two proportions – Student's t- test,F-test,χ^2-test.

TEXT BOOKS

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

REFERENCE BOOKS

1. **Steven C.Chapra,** Applied Numerical Methods with MATLAB for Engineering and science, Tata Mc.Graw Hill Education.
2. **M.K.Jain, S.R.K.Iyengar and R.K.Jain,** Numerical Methods for Scientific and Engineering Computation, New Age International Publications.
3. **Lawrence Turyn,** Advanced Engineering Mathematics, CRC Press.
4. **S.C.Gupta and V.K.Kapoor**, Fundamentals of Mathematical Statistics, 11/e, Sultan Chand & Sons Publications, 2012.
5. **Shron L.Myers, KeyingYe, Ronald EWalpole,** Probability and Statistics Engineers and the Scientists, 8^{th} Edition, Pearson 2007.
6. **Jayl.Devore,** Probability and Statistics for Engineering and the Sciences, 8^{th} Edition, Cengage.

WEB RESOURCES

1. https://en.wikibooks.org/wiki/Numerical_Methods/Equation_Solving
2. https://en.wikipedia.org/wiki/Numerical_integration
3. https://en.wikipedia.org/wiki/Probability_distribution
4. https://en.wikipedia.org/wiki/Sampling_(statistics)
5. https://en.wikipedia.org/wiki/Statistical_hypothesis_test

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II Year I Semester
UNIVERSAL HUMAN VALUES – UNDERSTANDING HARMONY and ETHICAL HUMAN CONDUCT
(Common to CE, EEE, ME, ECE, CSE, IT, CSE(AI&ML), CSE(AI), CSE(DS) and CSE(CYBER SECURITY)

Course Category	HSMC	**Course Code**	23HM301T
Course Type	Theory	**L-T-P-C**	2-1-0-3
Prerequisites		**Internal Assessment** **Semester End Examination** **Total Marks**	30 70 100

COURSE OUTCOMES		
Upon successful completion of the course, the student will be able to:		**Blooms Taxonomy Level**
CO1	Understand the significance of value inputs in a classroom and start applying them in their life and profession	K1
CO2	Distinguish between values and skills, happiness and accumulation of physical facilities, the Self and the Body, Intention and Competence of an individual, etc.	K2
CO3	Understand the role of a human being in ensuring harmony in Family And Society.	K1
CO4	Appraise the role of a human being in ensuring harmony in Nature/Existence.	K2
CO5	Distinguish between ethical and unethical practices to actualize a harmonious environment wherever they work.	K2

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

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

COURSE CONTENT

UNIT – I Introduction to Value Education: Right Understanding, Relationship and Physical Facility (Holistic Development and the Role of Education), Understanding Value Education, self-exploration as the Process for Value Education, Continuous Happiness and Prosperity-the basic human aspirations, Happiness and Prosperity- Current Scenario, Method to Fulfill the Basic Human Aspirations.
Practice Sessions: PS1 Sharing about Oneself , PS2 Exploring Human Consciousness, PS3 Exploring Natural Acceptance

UNIT – II Harmony in Human Being: Understanding Human being as the Co-existence of the self and the body, Distinguishing between the Needs of the self and the body, The body as an Instrument of the self, Understanding Harmony in the self, Harmony of the self with the body, Programme to ensure self - regulation and Health
Practice Sessions: PS4 Exploring the difference of Needs of self and body, PS5 Exploring Sources of Imagination in the self, PS6 Exploring Harmony of self with the body

UNIT – III Harmony in the Family and Society: Harmony in the family - the Basic Unit of Human Interaction, 'Trust' - the Foundational Value in Relationship, 'Respect' - as the Right Evaluation, Other Feelings, Justice in Human – to - Human Relationship, Understanding Harmony in the Society, Vision for the Universal Human Order.
Practice Sessions: PS7 Exploring the Feeling of Trust, PS8 Exploring the Feeling of Respect,
PS9 Exploring Systems to fulfil Human Goal

UNIT – IV Harmony in the Nature/Existence: Understanding Harmony in the Nature, Interconnectedness, self-regulation and Mutual fulfillment among the Four Orders of Nature, Realizing Existence as Co- existence at All Levels, The Holistic Perception of Harmony in Existence
Practice Sessions: PS10 Exploring the Four Orders of Nature, PS11 Exploring Co-existence in Existence

UNIT – V Implications of the Holistic Understanding - a Look at Professional Ethics: Natural Acceptance of Human Values, Definitiveness of (Ethical) Human Conduct, A Basis for Humanistic Education, Humanistic Constitution and Universal Human Order, Competence in Professional Ethics, Holistic Technologies, Production Systems and Management Models-Typical Case Studies, Strategies for Transition towards Value- based Life and Profession.
Practice Sessions: PS12 Exploring Ethical Human Conduct, PS13 Exploring Humanistic Models in Education, PS14 Exploring Steps of Transition towards Universal Human Order

Text books and Teachers Manual

1. A Foundation Course in Human Values and Professional Ethics, 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034-47-1 - R R Gaur, R Asthana, G P Bagaria
2. Teachers' Manual for A Foundation Course in Human Values and Professional Ethics, 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034-53-2 - R R Gaur, R Asthana, G P Bagaria

Reference Books

1. JeevanVidya: EkParichaya, A Nagaraj, JeevanVidyaPrakashan, 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

Web References:

1. https://fdp-si.aicte-india.org
2. https://www.youtube.com/playlist?list=PLWDeKF97v9SP_Kt6jqzA3pZ3yA7g_OAQz

PRAGATI ENGINEERING COLLEGE: SURAMPALEM

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II Year – I Semester

SURVEYING

Course Category	Engineering Science	**Course Code**	23CE301T
Course Type	Theory	**L-T-P-C**	3-0-0-3
Prerequisites		**Continuous Internal Assessment** **Semester End Examination** **Total Marks**	30 70 100

Course Objectives:	
1.	Know the principle and methods of surveying and measuring of horizontal and vertical- distances and angles
2.	Identification of source of errors, rectification methods and surveying principles to determine areas and volumes
3.	Know surveying principles to determine areas and volumes
4.	Setting out curves and use modern surveying equipments for accurate results
5.	Know the basics of Photogrammetric Surveying

Course Outcomes:

Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO 1	Illustrate the fundamentals in linear and compass survey	**K2**
CO 2	Identify the source of errors and rectification methods	**K2**
CO 3	Apply surveying principles to determine areas and volumes	**K3**
CO 4	Ability to set out curves and utilize modern surveying equipment.	**K3**
CO 5	Apply the basics of Photogrammetry Surveying in field	**K3**

K1: Remember, K2: Understand, K3: Apply, K4: Analyze, K5: Evaluate, K6: Create.

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

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

COURSE CONTENT

UNIT - I

Introduction and Basic Concepts: Introduction, Objectives, classification and principles of surveying, Surveying accessories. Introduction to Compass, leveling and Plane table surveying.
Linear distances- Approximate methods, Direct Methods- Chains- Tapes, ranging, Tape corrections.
Prismatic Compass- Bearings, included angles, Local Attraction, Magnetic Declination, and dip – systems and W.C.B and Q.B systems of locating bearings.

UNIT - II

Leveling- Types of levels, methods of levelling, and Determination of levels, Effect ofCurvature of Earth and Refraction.
Contouring- Characteristics and uses of Contours, methods of contour surveying.
Areas - Determination of areas consisting of irregular boundary and regular boundary.
Volumes -Determination of volume of earth work in cutting and embankments for level section, capacity of reservoirs.

UNIT - III

Theodolite Surveying: Types of Theodolites, temporary adjustments, measurement of horizontal angle by repetition method and reiteration method, measurement of vertical Angle, Trigonometrical leveling when base is accessible and inaccessible.
Traversing: Methods of traversing, traverse computations and adjustments, Introduction to Omitted measurements.

UNIT - IV

Curves: Types of curves and their necessity, elements of simple, compound, reverse curves. Introduction to Tacheometric Surveying.
Modern Surveying Methods: Principle and types of E.D.M. Instruments, Total station- advantages and Applications. Introduction to Global Positioning System. Introduction to Drone survey and LiDAR Survey(Light Detection And Ranging).

UNIT - V

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

Text Books:

1. Surveying (Vol – 1 & 2) by Duggal S K,Tata McGraw Hill Publishing Co.Ltd. New Delhi, 5th edition, 2019.
2. Textbook of Surveying by C Venkatramaiah , Universities Press 1st Edition, 2011.

Reference Books:

1. Surveying (Vol – 1), by B. C. Punmia, Ashok Kumar Jain and Arun Kumar Jain -Laxmi Publications (P) ltd., New Delhi, 18th edition 2024.
2. Surveying (Vol – 2), by B. C. Punmia, Ashok Kumar Jain and Arun Kumar Jain -Laxmi Publications (P) ltd., New Delhi 17th 2022.
3. Surveying (Vol – 3), by B. C. Punmia, Ashok Kumar Jain and Arun Kumar Jain -Laxmi Publications (P) ltd., New Delhi 16th 2023.
4. Plane Surveying and Higher Surveying‖ by Chandra A M, New age International Pvt. Ltd.,Publishers, New Delhi, 3rd Edition, 2015.
5. Surveying and Levelling by N.Basak Tata McGraw Hill Publishing Co. Ltd. New Delhi, 4th edition, 2014.
6. Surveying (Vol 1, 2 & 3), by Arora K R, Standard Book House, Delhi. Edition: 12th,2015.

Web Resources:

https://koha.srmap.edu.in/cgi-bin/koha/opac-detail.pl?biblionumber=11522&shelfbrowse_itemnumber=23066

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II Year – I Semester
STRENGTH OF MATERIALS

Course Category	Professional Core	**Course Code**	23CE302T
Course Type	Theory	**L-T-P-C**	3-0-0-3
Prerequisites		**Continuous Internal Assessment** **Semester End Examination** **Total Marks**	30 70 100

Course Learning Objectives:	
1.	To impart Fundamental concepts of Strength of Material and Principles of Elasticity and Plasticity Stress
2.	To impart concepts of shear force and bending moment on various types of beams andloading conditions
3.	To impart concepts of stresses developed in the cross section and bending equations calculation of section modulus of sections with different cross sections.
4.	To the concepts above will be utilized in measuring deflections in beams under various loading and support conditions.
5.	To classify cylinders and columns based on their thickness and to derive equations for measurement of stresses across the cross section when subjected to external pressure

Course Outcomes:

Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO 1	Recognize the basic materials behavior under the influence of different external loading conditions and the support conditions.	**K2**
CO 2	Draw the diagrams indicating the variation of the key performance features like axial forces, bending moment and shear forces in structural members.	**K2**
CO 3	Acquire knowledge of bending concepts and calculation of section modulus and for determination of stresses developed in the beams	**K2**
CO 4	Analyze the deflections due to various loading conditions.	**K4**
CO 5	Assess stresses across section of the thin, thick cylinders and columns to arrive at optimum sections to withstand the internal pressure using Lame's equation	**K4**

K1: Remember, K2: Understand, K3: Apply, K4: Analyze, K5: Evaluate, K6: Create.

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

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

COURSE CONTENT

UNIT — I:
Simple Stresses and Strains: Elasticity and plasticity — Types of stresses and strains — Hooke's law — Factor of safety, Poisson's ratio - Relationship between Elastic constants — Bars of varying section — stresses in composite bars.

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:
Flexural Stresses: Theory of simple bending — Assumptions — Derivation of bending equation, Neutral axis — Determination of bending stresses — section modulus of rectangular and circular sections (Solid and Hollow), I, T, Angle and Channel sections — Design of simple beams
Shear Stresses: Derivation of formula — Shear stress distribution across various beam sections like rectangular, circular, I, T Angle sections.
Torsion – circular shafts only.

UNIT — IV:
Deflection of Beams: 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:
Introduction – Classification of columns – Axially loaded compression members – Euler's crippling load theory – Derivation of Euler's critical load formulae for various end conditions – Equivalent length – Slenderness ratio – Euler's critical stress – Limitations of Euler's theory – Rankine – Gordon formula – Eccentric loading and Secant formula – Prof. Perry's formula.
Thin and Thick cylindrical shells — Derivation of formula for longitudinal and circumferential stresses — hoop, longitudinal and volumetric strains — changes in diameter, and volume of thin cylinders. Lames theory for thick cylinders, Derivation of Lames formulae, distribution of hoop and radial stresses across the thickness, compound cylinders- distribution of stresses

TEXTBOOKS:

1. Strength of Materials by R. K. Bansal, Lakshmi Publications, 16th Edition, 2022.
2. Strength of Materials by B. S. Basavarajaiah and P. Mahadevappa, Universities Press 3rd Edition, 2010
3. Strength of Materials by J.K. Gupta and S.K. Gupta, Cengage publications 2nd edition, 2024

REFERENCES:

1. Advanced Mechanics of Solids, L.S Srinath, McGraw Hill Education, 2017, 3rdEdition
2. Strength of Materials - Fundamentals andApplications, T.D.Gunneswara Rao and Mudim by Andal, Cambridge University Press, 2018, 1st Edition.
3. Mechanics of Materials, Beer and Johnston, McGraw Hill India Pvt. Ltd., 2020, 8thEdition (SI Units).
4. Mechanics of Solids — E P Popov, Prentice Hall, 2nd Edition, 2015.
5. A Textbook of Strength of Materials, by R. K. Rajput, 7e (Mechanics of Solids) SIUnits S. Chand & Co, NewDelhi 7th edition 2022.
6. Strength of Materials by S.S.Ratan Tata McGrill Publications 3rd Edition , 2016.

Web Resources:

1. https://rb.gy/k17kns
2. https://rb.gy/yiyyip

PRAGATI ENGINEERING COLLEGE: SURAMPALEM
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II Year – I Semester
FLUID MECHANICS

Course Category	Professional Core	**Course Code**	23CE303T
Course Type	Theory	**L-T-P-C**	3-0-0-3
Prerequisites		**Continuous Internal Assessment** **Semester End Examination** **Total Marks**	30 70 100

Course Objectives:	
1.	To explain basics of statics, kinematics and dynamics of fluids and various measuringtechniques of hydrostatic forces on objects.
2.	To impart ability to solve engineering problems in fluid mechanics
3.	To enable the students measure quantities of fluid flowing in pipes, tanks andchannels
4.	To teach integral forms of fundamental laws of fluid mechanics to predict relevantpressures, velocities and forces.
5.	To strengthen the students with fundamentals useful in application-intensive coursesdealing with hydraulics, hydraulic machinery and hydrology in future courses.

Course Outcomes:

Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Identify the principles of fluid statics, kinematics and dynamics	**K2**
CO2	Apply the laws of fluid statics and concepts of buoyancy	**K3**
CO3	Recognize the fundamentals of fluid kinematics and differentiate types of fluid flows	**K2**
CO4	Apply the Principle of conservation of energy for flow measurement.	**K3**
CO5	Analyse the losses in pipes and discharge through pipe network.	**K4**

K1: Remember, K2: Understand, K3: Apply, K4: Analyze, K5: Evaluate, K6: Create.

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

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

COURSE CONTENT

UNIT - I

Basic concepts and definitions: Distinction between a fluid and a solid; Density, Specific weight, Specific gravity, Kinematic and dynamic viscosity; Variation of viscosity with temperature, Newton law of viscosity; Vapor pressure, Boiling point, Surface tension, Capillarity, Bulk modulus of elasticity, Compressibility

UNIT – II

Fluid statics: Fluid Pressure: Pressure at a point, Pascal's law, pressure variation with temperature, density and altitude. Piezometer, U-Tube Manometer, Single Column Manometer, U Tube Differential Manometer. Pressure gauges, Hydrostatic pressure and force: horizontal, vertical and inclined surfaces. Buoyancy and stability of floating bodies

UNIT - III

Fluid kinematics:

Classification of fluid flow : steady and unsteady flow; uniform and non-uniform flow; laminar and turbulent flow; rotational and irrotational flow; compressible and incompressible flow; ideal and real fluid flow; one, two and three dimensional flows; Stream line, path line, streak line and stream tube; stream function, velocity potential function. One, two and three - Dimensional continuity equations in Cartesian coordinates.

UNIT - IV

Fluid Dynamics: Surface and body forces; Equations of motion - Euler's equation; Bernoulli's equation – Derivation; Energy Principle; Practical applications of Bernoulli's equation : Venturimeter, orifice meter and Pitot tube; Momentum principle; Forces exertedby fluid flow on pipe bend; Vortex Flow – Free and Forced; Definitions of Reynolds Number, Froude Number, Mach Number, Weber Number and Euler Number;

UNIT - V

Analysis Of Pipe Flow: Energy losses in pipelines; Darcy – Weisbach equation; Minor losses in pipelines; Hydraulic Grade Line and Total Energy Line; Concept of equivalent length – Pipes in Parallel and Series.

Textbooks:

1. P. M. Modi and S. M. Seth, Hydraulics and Fluid Mechanics, Standard Book House.
2. K. Subrahmanya, Theory and Applications of Fluid Mechanics, Tata McGraw Hill, 2nd edition 2018

Reference Books:

1. R. K. Bansal, A text of Fluid mechanics and hydraulic machines, Laxmi Publications (P) Ltd., New Delhi 11th edition, 2024.
2. N. Narayana Pillai, Principles of Fluid Mechanics and Fluid Machines, Universities Press Pvt Ltd, Hyderabad. 3rd Edition 2009.
3. Fluid Mechanics by Frank M. White, Henry Xue, Tata McGraw Hill, 9th edition ,2022.
4. C. S. P. Ojha, R. Berndtsson and P. N. Chadramouli, Fluid Mechanics and Machinery, Oxford University Press, 2010.
5. Introduction to Fluid Mechanics & Fluid Machines by S K Som, Gautam Biswas, S Chakraborty Tata McGraw Hill, 3rd edition 2011

Online Learning Resources:

1. **https://archive.nptel.ac.in/courses/112/105/112105269/**
2. **https://nptel.ac.in/courses/112104118**
3. **https://nptel.ac.in/courses/105103192**

PRAGATI ENGINEERING COLLEGE: SURAMPALEM
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II YEAR I SEM
SURVEYING LAB

Course Category	Professional Core	**Course Code**	23CE301P
Course Type	Laboratory	**L-T-P-C**	0-0-3-1.5
Prerequisites		**Continuous Internal Assessment** **Semester End Examination** **Total Marks**	30 70 100

Course Objectives: By the end of this course student will be able to	
1.	Know about various linear and angular measuring instruments
2.	Take Measurements in the linear and angular view
3.	Determine the area and volume by interpreting the data obtained from surveying activities
4.	Know modern equipment such as total station
5.	Draft field notes from survey data

Course Outcomes:

Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Handle various linear and angular measuring instruments	**K3**
CO2	Measure the linear and angular measurements	**K3**
CO3	Calculate the area and volume by interpreting the data obtained from surveying activities	**K2**
CO4	Handle modern equipment such as total station	**K3**
CO5	Prepare field notes from survey data	**K2**

K1: Remember, K2: Understand, K3: Apply, K4: Analyze, K5: Evaluate, K6: Create.

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

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO 1	2	2	-	2	1	-	-	-	3	2	2	2	2	-	-
CO 2	2	2	-	2	1	-	-	-	3	3	3	2	2	-	-
CO 3	2	2	-	2	1	-	-	-	3	2	2	2	2	-	-
CO 4	1	2			3				3	2	2	1	1		1
CO 5	2	1			-				3	2	2	1	1		1

List of Field Works:

1. Chain survey of road profile with offsets in case of road widening.
2. Determination of distance between two inaccessible points by using compass.
3. Plane table survey ;finding the area of a given boundary by the method of Radiation
4. Fly levelling : Height of the instrument method (differential leveling)
5. Fly levelling: rise and fall method.
6. Theodolite survey: determining the horizontal and vertical angles by the method of repetition method
7. Theodolite survey: finding the distance between two in accessible points.
8. Theodolite survey: finding the height of far object.
9. Determination of area perimeter using total station.
10. Determination of distance between two inaccessible point by using total station.
11. Setting out a curve
12. Determining the levels of contours.

Note: Any 10 experiments are to be conducted among

TEXT BOOKS

1. Surveying (Vol No.1, 2 &3) by B. C. Punmia, Ashok Kumar Jain and Arun Kumar Jain – Laxmi Publications (P) ltd, New Delhi.
2. Text book od Surveying by C. Venkataramaiah, University Press, India (P) Limited.

REFERENCE BOOKS

1. Text book of Surveying by S.K. Duggal (Vol No. 1&2), Tata McGraw Hill Publishing Co. Ltd. New Delhi.
2. Text book of Surveying by Arora (Vol No. 1&2), Standard Book House, Delhi.
3. Advance Surveying by Satish Gopi, R. Sathi Kumar and N. Madhu, Pearson Publications.

WEB RESOURCES

1. https://lecturenotes.in/notes/2827-note-for-surveying-1-s-1-by-swadhina-priyadarsini
2. https://nptel.ac.in/courses/105107122/1
3. https://nptel.ac.in/courses/105107158

PRAGATI ENGINEERING COLLEGE: SURAMPALEM
(Autonomous)
Department of Civil Engineering

R23

II YEAR I SEM
STRENGTH OF MATERIALS LAB

Course Category	Professional Core	**Course Code**	23CE302P
Course Type	Laboratory	**L-T-P-C**	0-0-3-1.5
Prerequisites		**Continuous Internal Assessment** **Semester End Examination** **Total Marks**	30 70 100

Course objectives: By the end of this course student will be able	
1.	To determine the tensile strength and yield parameters of mild steel
2.	To find out flexural strengths of Steel/Wood specimens and measure deflections
3.	To determine the torsion parameters of mild steel bar
4.	To determine the hardness numbers, impact and shear strengths of metals.
5.	To determine the load-deflection parameters for springs

Course Outcomes:

Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Conduct tensile strength test and draw stress-strain diagrams for ductile metals	**K2**
CO2	Perform bending test and determine load-deflection curve of steel/wood	**K3**
CO3	Able to conduct torsion test and determine torsion parameters	**K2**
CO4	Perform hardness, impact and shear strength tests and calculate hardness numbers,impact and shear strengths	**K3**
CO5	Tests on closely coiled and open coiled springs and calculate deflections	**K3**

K1: Remember, K2: Understand, K3: Apply, K4: Analyze, K5: Evaluate, K6: Create.

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

CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO 1	2	2	-	2	1	-	-	-	3	2	2	2	2	-	-
CO 2	2	2	-	2	1	-	-	-	3	3	3	2	2	-	-
CO 3	2	2	-	2	1	-	-	-	3	2	2	2	2	-	-
CO 4	1	2			3				3	2	2	1	1		-
CO 5	2	1			-				3	2	2	1	1		-

LIST OF EXPERIMENTS:

1. Tension test.
2. Bending test on (Steel/Wood) Cantilever beam.
3. Bending test on simply supported beam.
4. Torsion test.
6. Hardness test.
7. Compression test on Open coiled springs
8. Tension test on Closely coiled springs
9. Compression test on wood/ concrete
10. Izod / Charpy Impact test on metals
11. Shear test on metals
12. Use of electrical resistance strain gauges.
13. Continuous beam – deflection test.

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 B.S.Basavarajaiah and P. Mahadevappa, 3rd Edition,Universities Press.

REFERENCE BOOKS

1. Fundamentals of Solid Mechanics M.L. Gambhir, PHI Learning Pvt. Ltd., New Delhi.
2. Introduction to text book of Strength of Material by U.C. Jindal, Galgotia publications.

WEB RESOURCES

1. www.nptel.ac.in/courses
2. https://theconstructor.org

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II YEAR I SEM
BUILDING PLANNING AND DRAWING

Course Category	Skill Enhancement Course	**Course Code**	23CE301S
Course Type		**L-T-P-C**	0-1-2-2
Prerequisites		**Continuous Internal Assessment** **Semester End Examination** **Total Marks**	30 70 100

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.
4.	Giving training exercises on different building units.
5.	Imparting the skills and methods of planning of various buildings.

Course Outcomes:

Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Plan various buildings as per the building by-laws.	**K3**
CO2	Distinguish the relation between the plan, elevation and cross section and identify the form and functions among the buildings.	**K3**
CO3	Draw signs and bonds	**K2**
CO4	Draw different building units	**K3**
CO5	Learn the skills of drawing building elements and plan the buildings as per requirements	**K3**

K1: Remember, K2: Understand, K3: Apply, K4: Analyze, K5: Evaluate, K6: Create.

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

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

Syllabus:

1. Detailing & Drawing of Sign Conventions.
2. Detailing & Drawing of English Bond.
3. Detailing & Drawing of Flemish Bond.
4. Detailing & Drawing of Doors.
5. Detailing & Drawing of Windows.
6. Detailing & Drawing of Ventilators &Roofs.
7. Drawing of Line Diagram of Residential Buildings by using Building Bye- Laws.
8. Drawing of Plan, Elevation & Section from line diagram for a single Storey Building.
9. Drawing of Plan, Elevation & Section for Hospital Building.
10. Drawing of Plan, Elevation & Section for Industrial Building.

Text Books:

1. Planning, designing and Scheduling, Gurcharan Singh and Jagdish Singh
2. Building planning and drawing by M. Chakraborti.
3. Building drawing, M G Shah, C M Kale and S Y Patki, Tata McGraw Hill, NewDelhi.

Reference Books:

1. National Building Code 2016 (Volume- I & II).
2. Principles of Building Drawing, M G Shah and C M Kale, Trinity Publications,New Delhi.
3. Civil Engineering drawing and House planning, B. P. Verma, Khanna publishers,New Delhi.
4. Civil Engineering Building practice, Suraj Singh: CBS Publications, New Delhi,and Chennai
5. Building Materials and Construction, G. C Saha and Joy Gopal Jana, McGrawHill Education (P)India Ltd. New Delhi.

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II Year II Semester
MANAGERIAL ECONOMICS AND FINANCIAL ANALYSIS
(Common to CE, EEE, ECE, CSE, and CSE(CYBER SECURITY)

Course Category	Management Course - I	**Course Code**	23HM401T
Course Type	Theory	**L-T-P-C**	2 -0 -0-2
Prerequisites		**Internal Assessment** **Semester End Examination** **Total Marks**	30 70 100

Course Outcomes		**Blooms Taxonomy Level**
Upon successful completion of the course, the student will be able to		
CO 1	Understand of the concepts of managerial economics and demand in managerial decision making and predicting demand for goods and services	K1
CO 2	Assess the functional relation among production, cost of production, cost concepts and Break-Even Analysis.	K3
CO 3	Classify market structures for price and output decisions and Appraise the forms of business organizations and trade cycles in economic growth.	K1
CO 4	Apply capital budgeting techniques in financial decision making	K3
CO 5	Make use of the final accounting statements and analysis in financial decision making	K3

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

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1											1	
CO2											3	
CO3												1
CO4		2									3	2
CO5		2									3	2

COURSE CONTENT

Unit – I

Managerial Economics: Introduction – Nature, meaning, significance, functions, and advantages. Demand-Concept, Function, Law of Demand - Demand Elasticity- Types – Measurement. Demand Forecasting- Factors governing Forecasting, Methods. Managerial Economics and Financial Accounting and Management.

Unit – II

Production and Cost Analysis: Introduction – Nature, meaning, significance, functions and advantages. Production Function– Least- cost combination– Short run and long run Production Function- Isoquantsand Is costs, Cost & Break-Even Analysis - Cost concepts and Cost behaviour- Break-Even Analysis (BEA) - Determination of Break-Even Point (Simple Problems).

Unit – III

Business Organizations and Markets: Introduction – Forms of Business Organizations- Sole Proprietary - Partnership - Joint Stock Companies - Public Sector Enterprises. Types of Markets - Perfect and Imperfect Competition - Features of Perfect Competition Monopoly- Monopolistic - Competition– Oligopoly-Price-Output Determination - Pricing Methods and Strategies

Unit – IV

Capital Budgeting: Introduction – Nature, meaning, significance. Types of Working Capital, Components, Sources of Short-term and Long-term Capital, Estimating Working capital requirements. Capital Budgeting– Features, Proposals, Methods and Evaluation. Projects - Pay Back Period Method, Accounting Rate of Return (ARR) Net Present Value (NPV) Internal Rate Return (IRR) Method (sample problems)

Unit – V

Financial Accounting and Analysis: Introduction - Concepts and Conventions- Double-Entry Bookkeeping, Journal, Ledger, Trial Balance- Final Accounts (Trading Account, Profit and Loss Account and Balance Sheet with simple adjustments). Introduction to Financial Analysis - Analysis and Interpretation of Liquidity Ratios, Activity Ratios, and Capital structure Ratios and Profitability.

Textbooks:

1. Varshney & Maheswari: Managerial Economics, Sultan Chand.
2. Aryasri: Business Economics and Financial Analysis, 4/e, MGH.

Reference Books :

1. Suma Damodaran - Managerial Economics - Oxford - 2011.
2. Vanitha Agarwal - Managerial Economics - Pearson Publications- 2011.
3.V.Maheswari - Financial Accounting- Vikas Publications - 2018
4. S. A. Siddiqui & A. S. Siddiqui - Managerial Economics and Financial Analysis - New Age International Publishers – 2012

Web References: https://www.slideshare.net/123ps/managerial-economics-ppt
https://www.slideshare.net/rossanz/production-and-cost-45827016
https://www.slideshare.net/darkyla/business-organizations-19917607
https://www.slideshare.net/balarajbl/market-and-classification-of-market
https://www.slideshare.net/ruchi101/capital-budgeting-ppt-59565396
https://www.slideshare.net/ashu1983/financial-accounting

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II Year II Semester
ENGINEERING GEOLOGY

Course Category	Engineering Science	**Course Code**	23CE401T
Course Type	Theory	**L-T-P-C**	3-0-0-3
Prerequisites		**Continuous Internal Assessment** **Semester End Examination** **Total Marks**	30 70 100

Course Objectives:	
1.	To know the importance of Engineering Geology to the Civil Engineering.
2.	To enable the students understand what minerals and rocks are and their formation and identification.
3.	To highlight significance/ importance/ role of Engineering Geology in construction of Civil Engineering structures.
4.	To enable the student realize its importance and applications of Engineering Geology in Civil Engineering constructions.
5.	Concepts of Groundwater and its geophysical methods.

Course Outcomes:

Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Classify the significance of geological agents on Earth surface and its significance in Civil Engineering	**K2**
CO2	Identify and understand the properties of Minerals and Rocks.	**K3**
CO3	Identify the concepts of Groundwater and its geophysical methods.	**K2**
CO4	Classify and measure the Earthquake prone areas, Landslides and subsidence to practice the hazard zonation.	**K3**
CO5	Investigate the project site for mega/mini civil engineering projects and site selectionfor mega engineering projects like Dams, Reservoirs and Tunnels.	**K4**

K1: Remember, K2: Understand, K3: Apply, K4: Analyze, K5: Evaluate, K6: Create.

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

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

COURSE CONTENT

UNIT-I:
Introduction: Branches of Geology, Importance of Geology in Civil Engineering with case studies, Weathering of rocks, Geological agents, weathering process of Rock, Rivers and geological work of rivers.

UNIT-II
Mineralogy And Petrology: Definitions of mineral and rock-Different methods of study of mineral and rock. Physical properties of minerals and rocks for megascopic study for the following minerals and rocks. Common rock forming minerals: Feldspar, Quartz Group, Olivine, Augite, Hornblende, Mica Group, Asbestos, Talc, Chlorite, Kyanite, Garnet, Calcite and ore forming minerals are Pyrite, Hematite, Magnetite, Chlorite, Galena, Pyrolusite, Graphite, Chromite, Magnetite and Bauxite. Classification, structures ,textures and forms of Igneous rocks, Sedimentary rocks, Metamorphic rocks, and their megascopic study of granite varieties, (pink, gray, green). Pegmatite, Dolerite, Basalt etc., Shale, Sand Stone, Lime Stone, Laterite, Quartzite, Gneiss, Schist, Marble, Khondalite and Slate.

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

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

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

TEXT BOOKS:

1. Engineering Geology by N. ChennaKesavulu, Laxmi Publications . 2nd Edn 2014.
2. Engineering & General Geology by Parbin Singh Katson educational series 8th 2023

REFERENCES:

1. Engineering Geology by SubinoyGangopadhay Oxford University press 1st edition,2012.
2. Engineering Geology by D. Venkat Reddy, Vikas Publishing, 2nd Edn , 2017,
3. Geology for Engineers and Environmental Society' Alan E Kehew, 3rd edn., 2013)Pearson publications.
4. Environmental Geology' (2013) K.S.Valdiya, 2nd ed., McGraw Hill Publications.

Web Materials:

1. https://www.classcentral.com
2. https://www.poriyaan.in
3. https://www.academia.edu

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II Year II Semester
CONCRETE TECHNOLOGY

Course Category	Professional Core	**Course Code**	23CE402T
Course Type	Theory	**L-T-P-C**	3-0-0-3
Prerequisites		**Continuous Internal Assessment** **Semester End Examination** **Total Marks**	30 70 100

Course Objectives **Upon successful completion of this course, the student will be able to**	
1.	Learn materials and their properties used in the production of concrete
2.	Learn the behavior of concrete at fresh stage
3.	Learn the behavior of concrete at hardened stage
4.	Learn the influence of elasticity, creep and shrinkage on concrete
5.	Learn the mix design methodology and special concretes

Course Outcomes:

Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	explain the basic ingredients of concrete and their role in the production ofconcrete and its behaviour in the field.	**K2**
CO2	Test the fresh concrete properties and the hardened concrete properties. Understand the basic concepts of concrete. Design the concrete mix by BIS method.	**K3**
CO3	Evaluate the ingredients of concrete through lab test results. Realize the importance of quality of concrete.	**K5**
CO4	Understand the behaviour of concrete in various environments.	**K3**
CO5	explore the basic concepts of special concrete and their production and applications.	**K2**

K1: Remember, K2: Understand, K3: Apply, K4: Analyze, K5: Evaluate, K6: Create.

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

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

COURSE CONTENT

UNIT- I CEMENTS: Portland cement – Chemical composition – Hydration, Setting of cement, Fineness of cement, Structure of hydrate cement – Test for physical properties – Different grades of cements – Admixtures – Mineral and chemical admixtures – accelerators, retarders, air entrainers, plasticizers, super plasticizers, fly ash and silica fume

AGGREGATES: Classification of aggregate – Particle shape & texture – Bond, strength & other mechanical properties of aggregates – Specific gravity, Bulk density, porosity, adsorption & moisture content of aggregate – Bulking of sand –Deleterious substances – Soundness – Alkali aggregate reaction – Thermal properties – Sieve analysis – Fineness modulus – Grading curves – Grading of fine & coarse Aggregates Maximum aggregate size- Quality of mixing water

UNIT- II FRESH CONCRETE: Steps in Manufacture of Concrete–proportion, mixing, placing, compaction, finishing, curing – including various types in each stage. Properties of fresh concrete-Workability – Factors affecting workability – Measurement of workability by different tests, Setting times of concrete, Effect of time and temperature on workability – Segregation & bleeding – Mixing and vibration of concrete, Ready mixed concrete, Shotcrete

UNIT- III HARDENED CONCRETE: Water / Cement ratio – Abram's Law – Gel/space ratio - Nature of strength of concrete –Maturity concept – Strength in tension & compression – Factors affecting strength – Relation between compression & tensile strength – Curing, Testing of Hardened Concrete:Compression test – Tension test – Factors affecting strength – Flexure test –Splitting test – Non-destructive testing methods – Codal provisions for NDT.

UNIT- IV ELASTICITY, CREEP & SHRINKAGE – Modulus of elasticity – Dynamic modulus of elasticity – Poisson's ratio – Creep of concrete – Factors influencing creep – Relation between creep & time – Nature of creep – Effects of creep – Shrinkage –types of shrinkage.

UNIT- V MIX DESIGN AND SPECIAL CONCRETES: Ready mixed concrete, Fibre reinforced concrete – Different types of fibres – Factors affecting properties of FRC, High performance concrete – Self consolidating concrete, Self healing concrete.
Factors in the choice of mix proportions –Quality control of concrete- Statistical methods-Acceptance Criteria-Concepts Proportioning of concrete mixes by ACI method and IS Code method

TEXT BOOKS

1. Properties of Concrete by A.M. Neville – PEARSON – 4th edition
2. Concrete Technology by M.L. Gambhir. – Tata Mc.Graw Hill Publishers, New Delhi 5th edition 2013.
3. Concrete Technology by Job Thomas, Cengagae Publications, 1st edition, 2015.

References

1. Concrete Microstructure, Properties of Materials by P.K. Mehta and Moterio. McGraw Hill 4th edition 2014
2. Concrete Technology, J.J. Brooks and A. M. Neville, Pearson, 2019, 2nd Edition.
3. Concrete Technology by M. S. Shetty. – S. Chand & Co.; 2004
4. Concrete Technology by A.R. Santha Kumar, Oxford University Press, New Delhi.

Web Materials:

1. https://rb.gy/3r3dl0

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II Year – II Semester
STRUCTURAL ANLAYSIS

Course Category	Professional Core	**Course Code**	23CE403T
Course Type	Theory	**L-T-P-C**	3-0-0-3
Prerequisites		**Continuous Internal Assessment** **Semester End Examination** **Total Marks**	30 70 100

Course Learning Objectives **Upon successful completion of this course, the student will be able to**	
1.	Analysis of fixed and continuous beams
2.	Learn the analysis of indeterminate structures
3.	Learn about slope-deflection method
4.	Learn about Moment – distribution method
5.	Learn energy theorems

Course Outcomes:

Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Analysis of fixed and continuous beams Apply energy theorems to analyze trusses	**K3**
CO2	Analyze indeterminate structures by using Castigliano's–II theorem	**K4**
CO3	Analyze continuous beams and portal frames by using slope-deflection method	**K4**
CO4	Analyze continuous beams and portal frames by using Moment – distribution method	**K4**
CO5	Apply energy theorems to analyze trusses	**K4**

K1: Remember, K2: Understand, K3: Apply, K4: Analyze, K5: Evaluate, K6: Create.

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

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

COURSE CONTENT

UNIT – I

FIXED BEAMS & CONTINUOUS BEAMS : Introduction to statically indeterminate beams with uniformly distributed load, central point load, eccentric point load, number of pointloads, uniformly varying load, couple and combination of loads – Shear force and Bending moment diagrams – Deflection of fixed beams effect of sinking of support, effect of rotationof a support.

UNIT - II

ANALYSIS OF INDETERMINATE STRUCTURES: Indeterminate Structural Analysis – Determination of static and kinematic indeterminacies – Solution of trusses with upto two degrees of internal and external indeterminacies – Castigliano's–II theorem.

UNIT - III

SLOPE-DEFLECTION METHOD: Introduction-derivation of slope deflection equations-application to continuous beams with and without settlement of supports - Analysis of single bay portal frames without sway.

UNIT - IV

MOMENT DISTRIBUTION METHOD: Introduction to moment distribution method-Application to continuous beams with and without settlement of supports-Analysis of single bay storey portal frames without sway.

UNIT – V

ENERGY THEOREMS: Introduction-Strain energy in linear elastic system, expression of strain energy due to axial load, bending moment and shear forces – Castigliano's first theorem Deflections of simple beams and pin jointed trusses.

Textbooks:

1. Analysis of Structures – Vol-I&II by V.N.Vazirani &M.M.Ratwani, KhannaPublications, New Delhi.
2. Basic Structural Analysis by C.S.Reddy., Tata McGraw Hill Publishers. 3rd edition2017.

Reference Books:

1. Structural analysis by Aslam Kassimali Cengage publications 6th edition 2020.
2. Structural analysis Vol.I and II by Dr.R.Vaidyanathan and Dr.PPerumal– Laxmi publications. 3rd 2016.
3. Introduction to structural analysis by B.D.Nautiyal, New Age international publishers, New Delhi.
4. Structural Analysis – D.S.Prakasarao -Univeristy press.
5. Strength of Materials and Mechanics of Structures by B.C.Punmia, Khanna Publications, New Delhi.

Web Materials:

1. https://rb.gy/3od4w0
2. **https://rb.gy/c5rjv0**

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II Year II Semester
HYDRAULICS AND HYRAULIC MACHINERY

Course Category	Professional Core	**Course Code**	23CE404T
Course Type	Theory	**L-T-P-C**	3-0-0-3
Prerequisites	Fluid Mechanics	**Continuous Internal Assessment** **Semester End Examination** **Total Marks**	30 70 100

Course Objectives:	
1.	To Introduce concepts of laminar and turbulent flows
2.	To teach principles of uniform flows through open channel.
3.	To teach principles of non-uniform flows through open channel.
4.	To impart knowledge on design of turbines.
5.	To impart knowledge on design of pumps

Course Outcomes:

Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Explore the characteristics of laminar and turbulent flows.	**K2**
CO2	Apply the knowledge of fluid mechanics to address the uniform flow problems in open channels.	**K3**
CO3	Solve non-uniform flow problems and hydraulic jump phenomenon in open channel flows.	**K3**
CO4	Evaluate the performance of impact of jets on plates and design Pelton wheel, Francis and Kaplan turbine	**K5**
CO5	Identify the principles, losses and its efficiencies of centrifugal pumps	**K2**

K1: Remember, K2: Understand, K3: Apply, K4: Analyze, K5: Evaluate, K6: Create.

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

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

COURSE CONTENT

UNIT – I

Laminar & Turbulent flow in pipes: Laminar Flow- Laminar flow through: circular pipes, annulus and parallel plates. Stoke‘s law, Measurement of viscosity. Reynolds experiment, Transition from laminar to turbulent flow. Resistance to flow of fluid in smooth and rough pipes-Moody‘s diagram – Introduction to boundary layer theory.

UNIT - II

Uniform flow in Open Channels: Open Channel Flow - Comparison between open channel flow and pipe flow, geometrical parameters of a channel, classification of open channels, classification of open channel flow, Velocity Distribution of channel section. Hydraulically efficient channel sections: Rectangular, trapezoidal and triangular channels, Energy and Momentum correction factors

UNIT - III

Non-Uniform flow in Open Channels: Specific energy, critical flow, discharge curve, Specific force, Specific depth, and Critical depth. Measurement of Discharge and Velocity – Gradually Varied Flow- Dynamic Equation of Gradually Varied Flow. Hydraulic Jump and classification - Elements and characteristics- Energy dissipation.

UNIT - IV

Impact of Jets: Hydrodynamic force of jets on stationary and moving flat, inclined and curved vanes - Velocity triangles at inlet and outlet - Work done and efficiency Hydraulic Turbines: Classification of turbines; pelton wheel and its design. Francis turbine and its design - efficiency - Draft tube: theory - characteristic curves of hydraulic turbines. Cavitation: causes and effects.

UNIT – V

Pumps: Working principles of a centrifugal pump, work done by impeller; heads, losses and efficiencies; minimum starting speed; Priming; specific speed; limitation of suction lift, net positive suction head (NPSH); Performance and characteristic curves; Cavitation effects; Multistage centrifugal pumps; troubles and remedies

TEXT BOOKS: -

1. P. M. Modi and S. M. Seth, Hydraulics and Fluid Mechanics, Standard Book House 22nd, 2019.
2. K. Subrahmanya, Theory and Applications of Fluid Mechanics, Tata McGraw Hill, 2nd edition 2018

Reference Books:

1. R. K. Bansal, A text of Fluid mechanics and hydraulic machines, Laxmi Publications (P) Ltd., New Delhi 11th edition, 2024.
2. Fluid Mechanics by Frank M. White, Henry Xue, Tata McGraw Hill, 9th edition , 2022.
3. C. S. P. Ojha, R. Berndtsson and P. N. Chadramouli, Fluid Mechanics and Machinery, Oxford University Press, 2010.
4. Introduction to Fluid Mechanics & Fluid Machines by S K Som, Gautam Biswas, S Chakraborty 3rd edition 2011

Online Learning Resources:

1. https://nptel.ac.in/courses/105105203
2. https://archive.nptel.ac.in/courses/112/106/112106300/
3. https://archive.nptel.ac.in/ courses/112/103/112103249/

PRAGATI ENGINEERING COLLEGE: SURAMPALEM
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R23

II Year II Semester
CONCRETE TECHNOLOGY LABORATORY

Course Category	Professional Core	**Course Code**	23CE402P
Course Type	Laboratory	**L-T-P-C**	0-0-3-1.5
Prerequisites		**Continuous Internal Assessment** **Semester End Examination** **Total Marks**	30 70 100

Course Objectives
Upon successful completion of this course, the student will be able to
1. Test basic properties of ingredients of concrete fresh and hardened concrete properties

Course Outcomes:

Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Outline importance of testing cement and its properties	**K2**
CO2	Assess different properties of Aggregates	**K3**
CO3	Assess fresh concrete properties and their relevance to hardened concrete	**K3**
CO4	Assess hardened concrete properties	**K5**

K1: Remember, K2: Understand, K3: Apply, K4: Analyze, K5: Evaluate, K6: Create.

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

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

Detailed Syllabus:

1.Tests on Cement

Normal Consistency and Fineness of cement.
Initial setting time and Final setting time of cement.
Specific gravity and soundness of cement.
Compressive strength of cement.

2.Tests on Fine Aggregates

Grading and fineness modulus of Fine aggregate by sieve analysis.
Specific gravity of fine aggregate
Water absorption and Bulking of sand

3.Tests on Coarse Aggregates

Grading of Coarse aggregate by sieve analysis.
Specific gravity of coarse aggregate.
Water absorption of Coarse aggregates.

4.Tests on fresh Concrete

Workability of concrete by compaction factor method
Workability of concrete by slump test
Workability of concrete by Vee-bee test.

5. Tests on Hardened Concrete

Compressive strength of cement concrete and Modulus of rupture
Young's Modulus and Poisson's Ratio
Split tensile strength of concrete.
Non-Destructive testing on concrete (for demonstration)

TEXT BOOKS

1. Concrete Technology by M.S. Shetty – S. Chand & Co.
2. Concrete Manual by M.L. Gambhir, Dhanpat Rai & Sons

REFERENCE BOOKS

1. Concrete Manual by M.L. Gambhir, Dhanpat Rai & Sons
2. Highway Material Testing manual, Khanna, Justo and Veeraraghavan, Nemchand Brothers

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II Year II Semester
ENGINEERING GEOLOGY LABORATORY

Course Category	Professional Core	**Course Code**	23CE401P
Course Type	Laboratory	**L-T-P-C**	0-0-3-1.5
Prerequisites		**Continuous Internal Assessment** **Semester End Examination** **Total Marks**	30 70 100

Course Objectives:	
1.	To identify the Megascopic types of Ore minerals & Rock forming minerals.
2.	To identify the Megascopic types of Igneous, Sedimentary, Metamorphic rocks.
3.	To identify the topography of the site & material selection

Course Outcomes:

Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Identify Megascopic minerals & their properties	**K2**
CO2	Identify Megascopic rocks & their properties.	**K3**
CO3	Identify the site parameters such as contour, slope & aspect for topography.	**K3**
CO4	Know the occurrence of materials using the strike & dip problems.	**K3**

K1: Remember, K2: Understand, K3: Apply, K4: Analyze, K5: Evaluate, K6: Create.

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

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

LIST OF EXPERIMENTS

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

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

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

4. Simple Structural Geology problems.

5. Bore hole data

6. Strength of the rock using laboratory tests.

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

LAB EXAMINATION PATTERN:

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

REFERENCES:

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

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II Year II Semester
REMOTE SENSING AND GIS

Course Category	Skill Enhancement Course	**Course Code**	23CE401S
Course Type		**L-T-P-C**	0-1-2-2
Prerequisites		**Continuous Internal Assessment** **Semester End Examination** **Total Marks**	30 70 100

Course Learning Objectives:
The course is designed to

1.	Introduce the basic principles of Remote Sensing and GIS techniques and itsapplication to Civil Engineering.
2.	Learn various types of sensors and platforms and understand the principles of spatialanalysis techniques in GIS.
3.	Introduce GIS software to understand the process of digitization, creation of thematicmap from Topo sheets and maps.

Course outcomes

Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Acquire knowledge about concepts of remote sensing, sensors and their characteristics	**K2**
CO2	Explore with data models and data structures to introduce various Raster and Vector Analysis capabilities in GIS.	**K3**
CO3	Digitize and create thematic map and extract important features to calculate geometry.	**K3**
CO4	Perform surface analysis over Contour to develop digital elevation model.	**K3**
CO5	Use GIS software to perform simple analysis in water resources and transportation engineering	**K3**

K1: Remember, K2: Understand, K3: Apply, K4: Analyze, K5: Evaluate, K6: Create.

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

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO12	PSO1	PSO2	PSO3
CO 1	2		1	1			2					2	1		1
CO 2	2		1	1			2					2	1		1
CO 3	1	2	2	1	2	2	3		2	2	1	3	1		2
CO 4	1	2	2	1	2	2	3		2	2	1	3	2		2
CO 5	1	2	2	1	2	2	3		2	2	1	3	2		2

COURSE CONTENT

UNIT – I

Introduction to Remote sensing: History of Remote Sensing, Electromagnetic Radiation, Electromagnetic Spectrum, Energy Interaction with Atmosphere, Energy Interaction with the Earth Surfaces - Characteristics of Remote Sensing Systems, Sensor Resolutions, Advantages & Limitations - Platforms: Types of Sensors, Airborne Remote Sensing, Spaceborne Remote Sensing - IRS, LANDSAT, SPOT & Recent satellite.

UNIT – II

Digital Image analysis: Digital Image Characteristics, Digital Image Data Formats, Band Interleaved by Pixel (BIP), Band Interleaved by Line (BIL), Band Sequential (BSQ) - Visual Interpretation Elements, Preprocessing, Enhancement, Classification, Supervised classification, Unsupervised classification.

UNIT – III

Introduction to Geographic Information System: Principles, Components and Applications of GIS - Map projections, Spatial Data Structures, Raster and Vector Data Formats, Data Inputs, Data Manipulation, Data Retrieval, Data Analysis - Spatial data analysis: Overlay Function-Vector Overlay Operations, Raster Overlay Operations, Arithmetic Operators, Comparison and Logical Operators, Conditional Expressions - Network Analysis: Components of network, Transportation network - Optimum pathanalysis.

TEXT BOOKS:

1. BasudebBhatta (2021). 'Remote sensing and GIS', 3rdedn., Oxford University Press.
2. S. Kumar, (2016) 'Basics of Remote sensing & GIS', Laxmi Publications.
3. Lillesand, T.M, R.W. Kiefer and J.W. Chipman (2022) 'Remote Sensing and Image Interpretation', 7thedn., Wiley India Pvt. Ltd.
4. Demers, M.N, (2013) 'Fundamentals of Geographic Information Systems', 4thedn., Wiley India Pvt. Ltd.

List of Experiments:

Expt. 1 : Georeferencing a Toposheet or Map
Expt. 2 : Digitization and Attribute table creation.
Expt. 3 : Creation of Thematic Map
Expt. 4 : Calculation of Feature geometry – Length, Area & Perimeter.
Expt. 5 : Contour map – developing TIN & DEM from Contour.
Expt. 6 : Stream network – Stream ordering map.
Expt. 7 : Watershed - calculate Hydro-geomorphological parameters.
Expt. 8 : Transportation Network Map – Route analysis.

GIS SOFTWARE: QGIS / ArcGIS

Textbook for Practical

1. QGIS User Guide
2. ArcGIS User Manual by ESRI

REFERENCES:

1. Schowengerdt, R. A (2006) 'Remote Sensing', Elsevier publishers.
2. Burrough P A and R.A. McDonnell, (1998) 'Principals of Geographical Information Systems', Oxford University Press.
3. George Joseph (2013) 'Fundamentals of Remote Sensing', Universities Press.

Web references:

1. https://nptel.ac.in/courses/10510319

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II Year II Semester
DESIGN THINKING & INNOVATION
(Common to CE, EEE, ME, ECE, CSE, IT, CSE(AI&ML), CSE(AI), CSE(DS) and CSE(CYBER SECURITY)

Course Category	BS&H	**Course Code**	23HM401P
Course Type	Theory	**L-T-P-C**	1 -0 -2-2
Prerequisites		**Internal Assessment** **Semester End Examination** **Total Marks**	30 70 100

Course Outcomes		**Blooms Taxonomy Level**
Upon successful completion of the course, the student will be able to		
CO 1	Define the concepts related to design thinking.	K1
CO 2	Explain the fundamentals of Design Thinking and innovation.	K2
CO 3	Apply the design thinking techniques for solving problems in various sectors.	K3
CO 4	Analyze to work in a multidisciplinary environment.	K4
CO 5	Evaluate the value of creativity.	K5

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

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	1	3		1	3					1	1
CO2			3		2	3						
CO3		1	3			3			1			1
CO4			3			3						
CO5			3			3					3	2

COURSE CONTENT

UNIT – I Introduction to Design Thinking

Introduction to elements and principles of Design, basics of design-dot, line, shape, form as fundamental design components. Principles of design. Introduction to design thinking, history of Design Thinking, New materials in Industry.

UNIT - II Design Thinking Process

Design thinking process (empathize, analyze, idea & prototype), implementing the process in driving inventions, design thinking in social innovations. Tools of design thinking - person, costumer, journey map, brainstorming, product development

Activity: Every student presents their idea in three minutes, Every student can present design process in the form of flow diagram or flow chart etc. Every student should explain about product development.

UNIT - III Innovation

Art of innovation, Difference between innovation and creativity, role of creativity and innovation in organizations. Creativity to Innovation. Teams for innovation, Measuring the impact and value of creativity.

Activity: Debate on innovation and creativity, Flow and planning from idea to innovation, Debate on value-based innovation.

UNIT - IV Product Design

Problem formation, introduction to product design, Product strategies, Product value, Product planning, product specifications. Innovation towards product design Case studies.

Activity: Importance of modeling, how to set specifications, Explaining their own product design.

UNIT – V Design Thinking in Business Processes

Design Thinking applied in Business & Strategic Innovation, Design Thinking principles that redefine business – Business challenges: Growth, Predictability, Change, Maintaining Relevance, Extreme competition, Standardization. Design thinking to meet corporate needs. Design thinking for Startups. Defining and testing Business Models and Business Cases. Developing & testing prototypes.

Activity: How to market our own product, about maintenance, Reliability and plan for startup.

Textbooks:

1. Tim Brown, Change by design, 1/e, Harper Bollins, 2009.
2. Idris Mootee, Design Thinking for Strategic Innovation, 1/e, Adams Media, 2014.

Reference Books:

1. David Lee, Design Thinking in the Classroom, Ulysses press, 2018.
2. Shrrutin N Shetty, Design the Future, 1/e, Norton Press, 2018.
3. William lidwell, Kritinaholden, &Jill butter, Universal principles of design, 2/e, Rockport Publishers, 2010.
4. Chesbrough.H, The era of open innovation, 2003.

Web Resources:

- https://nptel.ac.in/courses/110/106/110106124/
- https://nptel.ac.in/courses/109/104/109104109/
- https://swayam.gov.in/nd1_noc19_mg60/preview
- https://onlinecourses.nptel.ac.in/noc22_de16/preview

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R23

II Year II Semester
BUILDING MATERIALS AND CONSTRUCTIONS

Course Category	Mandatory Course	**Course Code**	23CE405T
Course Type		**L-T-P-C**	3-0-0-0
Prerequisites		**Continuous Internal Assessment** **Semester End Examination** **Total Marks**	30 70 100

Course Learning Objectives: The course is designed to	
1.	To develop the building walls and foundations and how they are useful for buildings.
2.	In these mainly we know about building arches, roofs, doors, windows and ventilators and how they are given for buildings.
3.	To develop the form work and finishing work which is used for buildings and to solve the defects of building properties which are able to know with material
4.	Painting is also taken for a beautiful looking structure for the good manner.
5.	These courses explain about the material which we want to use and how we want to use and how to give a good building for using purpose

Course outcomes

Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Identify relevant type of construction materials for the given type of building.	**K2**
CO2	Use the relevant type of special purpose construction materials in the given situation.	**K3**
CO3	Undertake the given type of building construction activity for the given component of building structure.	**K3**
CO4	Design the relevant means of communication for the given building structure.	**K3**
CO5	Use the relevant type of material for finishing purpose in the given situation.	**K3**

K1: Remember, K2: Understand, K3: Apply, K4: Analyze, K5: Evaluate, K6: Create.

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

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO12	PSO1	PSO2	PSO3
CO 1	2		1	1			2					2	1		1
CO 2	2		1	1			2					2	1		1
CO 3	1	2	2	1	2	2	3		2	2	1	3	1		2
CO 4	1	2	2	1	2	2	3		2	2	1	3	2		2
CO 5	1	2	2	1	2	2	3		2	2	1	3	2		2

COURSE CONTENT

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

UNIT II: LIME AND CEMENT Lime: Various ingredients of lime – Constituents of lime stone – classification of lime – various methods of manufacture of lime. Cement: Portland cement- Chemical Composition – Hydration, setting and fineness of cement. Various types of cement and their properties. Various field and laboratory tests for Cement. Various ingredients of cement concrete and their importance – various tests for concrete.

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

UNIT IV : FINISHINGS Damp Proofing and water proofing materials and uses – Plastering Pointing, white washing and distempering – Paints: Constituents of a paint – Types of paints – Painting of new/old wood- Varnish. Form Works and Scaffoldings.

UNIT V: AGGREGATES Classification of aggregate – Coarse and fine aggregates- particle shape and texture – Bond and Strength of aggregate – Specific gravity – Bulk Density, porosity and absorption – Moisture content of AggregateBulking of sand – Sieve analysis.

Text Books:

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

References:

1. Building Materials by S.K.Duggal, New Age International Publications.
2. Building Materials by P.C.Verghese, PHI learning (P) ltd.
3. Building Materials by M.L.Gambhir, Tata McGraw Hill Publishing Co. Ltd. New Delhi.
4. Building construction by P.C.Verghese, PHI Learning (P) Ltd.

PRAGATI ENGINEERING COLLEGE

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Department of Civil Engineering

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III Year I Semester

Design and Drawing of Reinforced Concrete Structures

Course Category	Professional Core	**Course Code**	
Course Type	Theory	**L-T-P-C**	3-0-0-3
Prerequisites	Strength of materials, Concrete Technology	**Continuous Internal assessment** **Semester End Examination** **Total Marks**	30 70 100

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

Course Outcomes:		
Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Design Reinforced Concrete beams using limit state and working stress methods	**K3**
CO2	Design of flexural members and detailing	**K3**
CO3	Design structures subjected to shear, bond and torsion	**K3**
CO4	Design structures of compression members and different types of footings	**K3**
CO5	Design Reinforced Concrete slabs	**K3**

K1: Remember, K2: Understand, K3: Apply, K4: Analyze, K5: Evaluate, K6: Create.

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

CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PS01**	**PSO2**	**PSO3**
CO1	3	3	3	-	1	-	-	-	-	-	-	-	2	-
CO2	3	3	3	-	1	-	-	-	-	-	-	-	2	-
CO3	3	3	3	-	1	-	-	-	-	-	-	-	2	-
CO4	3	3	3	-	1	-	-	-	-	-	-	-	2	-
CO5	3	3	3	-	1	-	-	-	-	-	-	-	2	-

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COURSE CONTENT

UNIT –I

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

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

UNIT–II

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

UNIT–III

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

UNIT–IV

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

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

UNIT–V

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

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

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

FINAL EXAMINATION PATTERN:

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

TEXT BOOKS:

1. **'**Limit State Design' by A. K. Jain
2. 'Reinforced Concrete Structures' by S. Unnikrishna Pillai & DevdasMenon, Tata Mc.Graw Hill, New Delhi.

REFERENCES:

1. 'Design of concrete structures' by N. Krishna Raju.

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

Web References:

1. https://onlinecourses.nptel.ac.in/noc22_ce65/preview.

PRAGATI ENGINEERING COLLEGE

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Department of Civil Engineering

R23

III Year – II Semester

Engineering Hydrology

Course Category	Professional Core	**Course Code**	
Course Type	Theory	**L-T-P-C**	3-0-0-3
Prerequisites		**Continuous Internal Assessment**	30
		Semester End Examination	70
		Total Marks	100

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

Course Outcomes:

Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Apply principles of fluid mechanics and hydrology to quantify water movement.	**K2**
CO2	Develop Intensity-Duration-Frequency and Depth-Area Duration curves to design hydraulic structures.	**K2**
CO3	Develop unit hydrograph and synthetic hydrograph.	**K3**
CO4	Estimate flood magnitude and carry out flood routing.	**K3**
CO5	Determine aquifer parameters and yield of wells.	**K3**

K1: Remember, K2: Understand, K3: Apply, K4: Analyze, K5: Evaluate, K6: Create.

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

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

COURSE CONTENT

UNIT–I

Introduction: Engineering hydrology and its applications, Hydrologic cycle, hydrological data-sources of data. Precipitation: Types and forms, measurement, introduction to radar measurement of rain fall, rain gauge network, presentation of rainfall data, average rainfall, continuity and consistency of rainfall data, frequency of rainfall, Intensity-Duration-Frequency (IDF) curves, Depth-Area-Duration (DAD) curves, Probable Maximum Precipitation (PMP), design storm

UNIT–II

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

UNIT–III

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

Hydrograph analysis: Components of hydrograph, separation of base flow, effective rainfall hyetograph and direct runoff hydrograph, unit hydrograph, assumptions, derivation of unit hydrograph, unit hydrographs of different durations, principle of superposition and S hydrograph methods, limitations and applications of unit hydrograph, dimensionless unit hydrograph, synthetic unit hydrograph, introduction to IUH.

UNIT–IV

Floods: Causes and effects, frequency analysis- Gumbel's and Log-Pearson type III distribution methods, Standard Project Flood (SPF) and Probable Maximum Flood (MPF), flood control methods and management. Flood Routing: Hydrologic routing, channel and reservoir routing-Muskingum and Puls methods of routing.

UNIT–V

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

Text Books:

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

Reference Books:

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

Web Resources:

1. Engineering Hydrology - Course

PRAGATI ENGINEERING COLLEGE

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Department of Civil Engineering

III Year – I Semester

Geotechnical Engineering-I

Course Category	Professional Core	**Course Code**	
Course Type	Theory	**L-T-P-C**	3-0-0-3
Prerequisites	Nil	**Continuous Internal Assessment**	30
		Semester End Examination	70
		Total Marks	100

Course Objectives: The course objectives are:	
1.	To enable the student to understand soil structure and texture, identify and classify soils based on their properties.
2.	To impart the concept of effective stress principle, and various tests to determine coefficient of permeability.
3.	To enable the student to understand the concept of seepage through soil, and vertical stress distribution in soils under different loading conditions.
4.	To enable the student to understand the concepts of compaction and compressibility of soils.
5.	To enable the student to understand the concept of shear strength parameters and bearing capacity of soils.

Course Outcomes:

Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Understand and determine geotechnical properties of soil and identify its nomenclature which helps in deriving its behavior at various in situ conditions.	K2
CO2	Apply effective stress concept to determine effective stresses in soil and determine coefficient of permeability of soils.	K3
CO3	Determine and evaluate vertical stresses in soil under various loads and understand seepage characterization under various hydraulic structures.	K5
CO4	Apply the knowledge of compaction during the construction of roads, embankments, canals etc, on weak soils and practical problems related to consolidation settlements and time rate of settlements.	K3
CO5	Evaluate shear strength parameters and compute bearing capacity of soils.	K5

K1: Remember, K2: Understand, K3: Apply, K4: Analyze, K5: Evaluate, K6: Create.

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

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

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COURSE CONTENT

UNIT – I

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

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

UNIT – II

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

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

UNIT –III

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

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

UNIT – IV

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

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

UNIT - V

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

TEXTBOOKS:

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

REFERENCES:

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

Web References:

1.https://archive.nptel.ac.in/courses/105/105/105105168/#:~:text=NPTEL%20::%20Civil%20Engineering%20%2D%20NOC,:%20SHEAR%20STRENGTH%20(Contd.)

PRAGATI ENGINEERING COLLEGE

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Department of Civil Engineering

III Year – I Semester

Advanced Structural Analysis

Course Category	Professional Elective-I	**Course Code**	
Course Type	Theory	**L-T-P-C**	3-0-0-3
Prerequisites	Strength of materials Structural Analysis Engineering Mechanics	**Continuous Internal assessment** **Semester End Examination** **Total Marks**	30 70 100

Course Objectives:	
1.	To understand the distinction between determinate and indeterminate structures,
2.	To develop the ability to analyze structures subjected to lateral loads
3.	To analyze multi-storey frames and draw shear force and bending moment diagrams.
4.	To explore the behavior and analysis of cable-supported structures
5.	To understand the methods like Moment Distribution and Kani's Method

Course Outcomes:

Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Differentiate the Determinate and Indeterminate Structures	**K3**
CO2	Understand about lateral Load analysis of structures	**K2**
CO3	Analyze safe building structures using engineering methods.	**K4**
CO4	Analyze Cable and Suspension Bridge structures	**K4**
CO5	Analyze structures using Moment Distribution, Kani's Method	**K4**

K1: Remember, K2: Understand, K3: Apply, K4: Analyze, K5: Evaluate, K6: Create.

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

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

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COURSE CONTENT

UNIT–I

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

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

UNIT-II

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

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

UNIT-III

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

UNIT – IV

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

UNIT – V

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

Kani's Method: Analysisofcontinuousbeams–includingsettlementofsupportsandsingle bay portal frames with and without side sway. Shear force and bending moment diagrams - Elastic curve

Text Books:

1. Structural Analysis by R.C. Hibbeler, Pearson, New Delhi.
2. Analysis of Structures- Vol. I and II, V. N. Vazirani and M. M. Ratwani, Khanna Publishers, New Delhi.

References:

1. Mechanics of Structures Vol – II by H.J.Shah and S.B. Junnarkar, Charotar Publishing House Pvt. Ltd.
2. Structural Analysis by Devdas Menon, Narosa Publishing Housing Pvt. Ltd.
3. Structural Analysis: A Matrix Approach, G.S.Pandit and S.P.Gupta, Mc Graw Hill PvtLtd.

Web References:

1. **https://onlinecourses.nptel.ac.in/noc25_ce110/preview**

PRAGATI ENGINEERING COLLEGE

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Department of Civil Engineering

III Year – I Semester
Architecture and Town Planning

Course Category	Professional Elective-I	**Course Code**	
Course Type	Theory	**L-T-P-C**	3-0-0-3
Prerequisites		**Continuous Internal assessment**	30
		Semester End Examination	70
		Total Marks	100

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

Course Outcomes:

Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Distinguish architectural styles of eastern and western world.	**K2**
CO2	Understand the importance of Orders of architecture.	**K2**
CO3	Understand town planning from ancient times to modern times.	**K2**
CO4	Compose spaces of buildings using design concepts, planning principles.	**K3**
CO5	Understand the town planning standards, landscaping features and regulations controlling expansion of the towns and the cities	**K3**

K1: Remember, K2: Understand, K3: Apply, K4: Analyze, K5: Evaluate, K6: Create.

Contribution of Course Outcomes towards achievement of Program Outcomes : (1 – Low, 2 - Medium, 3 – High)														
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**	**PSO3**
CO1	2	1	1	-	-	2	1	-	1	-	1	2	1	3
CO2	2	1	2	1	-	1	1	-	1	-	1	2	1	2
CO3	2	2	2	1	1	3	1	1	2	1	2	3	1	3
CO4	3	2	3	2	2	2	1	1	2	1	2	2	2	3
CO5	2	2	2	2	1	3	1	-	2	1	2	1	1	1

COURSE CONTENT

UNIT-I

History of Architecture: Western Architecture: Egyptian, Greek, Roman Architectures- Orders. Indian Architecture: Vedic age, Indus valley civilization. Temples of Religions: Buddhist period: Stambas, Stupas, Toranas, Chaityas, Viharas – Hindu temples: Dravidian and Indo Aryan Styles-Temple of Aihole, Madurai, Bhubaneshwar, Mount Abu. Indo Sarsanic (Islamic) Architecture: Mosque - Palace - Fort - Tomb.

UNIT-II

Principles of designing and Planning: Principles of planning a residence-site selection, site orientation- aspect, prospect, grouping, circulation, privacy, furniture requirements, services and other factors. Post-classic Architecture: Introduction of post-classic architecture-contribution of eminent architects to modern period-Edward Lutyens, Le Corbusier, Frank Lloyd Wrigt, Walter Groping**.**

UNIT-III

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

UNIT-IV

Modern Town Planning: Zoning- Roads and road traffic- Housing- Slums, Parks, Play grounds- Public Utility Services- Surveys and maps for planning- Neighborhood Planning. Standards of Town planning: Planning new towns, planning standards and specifications, national and regional planning, town planning and legislation-planning regulations and limitations.

UNIT-V

Land Scaping and Expansion of Towns: Land scaping for the towns, horizontal and vertical expansion of towns-garden cities, satellite towns-floating towns-skyscrapers 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'byPercy 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 Hand book' by John Patten Guthrie–McGraw Hill International Publications.
3. 'Modern Ideal Homes for India'by R.S.Deshpande.
4. 'Town and County Planning' by A.J.Brown and H.M.Sherrard.
5. 'Town Design'by Federik Glbbard, Architectural press,London.

Web Resources:

1. **Introduction to Urban Planning - Course**

PRAGATI ENGINEERING COLLEGE

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Department of Civil Engineering

III Year – I Semester

Construction Technology and Management

Course Category	Professional Elective-I	**Course Code**	
Course Type	Theory	**L-T-P-C**	3-0-0-3
Prerequisites	Building materials, Project management basics	**Continuous Internal Assessment** **Semester End Examination** **Total Marks**	30 70 100

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

Course Outcomes:

Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Explain the principles of construction project management, including planning, scheduling, monitoring, and coordination using CPM and PERT techniques.	**K2**
CO2	Apply project evaluation methods, cost analysis, and resource optimization techniques using construction management software like Primavera.	**K3**
CO3	Analyze the selection, capacity, and productivity of various construction equipment for earthwork, compaction, hoisting, and concreting operations.	**K4**
CO4	Demonstrate the operation and application of concreting equipment, including batching plants, mixers, and finishing tools for quality construction.	**K3**
CO5	Evaluate construction methods, formwork practices, and safety measures, incorporating BIM concepts for effective civil engineering project execution	**K5**

K1: Remember, K2: Understand, K3: Apply, K4: Analyze, K5: Evaluate, K6: Create.

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

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

PRAGATI ENGINEERING COLLEGE

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COURSE CONTENT

UNIT–I

Construction project management and its relevance – qualities of project manager – project planning – coordination –scheduling - monitoring – bar charts – milestone charts – critical path method

UNIT-II

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

UNIT-III

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

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

UNIT – IV

Concreting equipment— concrete mixers–Batching plants, mobile using plant sike "Ajax" etc. mixing and placing of concrete – consolidating and finishing.

UNIT – V

Construction methods – earthwork – piling – placing of concrete – form work – fabrication and erection–quality control and safety engineering. BIM for Civil Engineers (Building Information Modeling)

Text Books:

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

References:

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

Web References:

1. NPTEL :: Civil Engineering - NOC:Principles of Construction Management

PRAGATI ENGINEERING COLLEGE

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Department of Civil Engineering

R23

III Year – I Semester
PROFESSIONAL ELECTIVE – I

Any of the 12- Week Swayam / NPTEL (MOOCs)

1. Admixtures and special Concrete
   https://onlinecourses.nptel.ac.in/noc25_ce93/preview

2. Introduction to Engineering Seismology
   https://onlinecourses.nptel.ac.in/noc25_ce100/preview

3. Optimization Methods for Civil Engineering
   https://onlinecourses.nptel.ac.in/noc25_ce105/preview

PRAGATI ENGINEERING COLLEGE

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Department of Civil Engineering

III Year I Semester

Renewable Energy Sources

(Common to CE, ME, ECE, CSE, IT, CSE-CS, CSE-DS, CSE-AI, CSE-AIML)

Course Category	Open Elective Courses	**Course Code**	
Course Type	Theory	**L-T-P-C**	**3-0-0-3**
Prerequisites	Basic Electrical Engineering	**Internal Assessment**	**30**
		Semester End Examination	**70**
		Total Marks	**100**

COURSE OBJECTIVES	
1	To study the solar radiation data, equivalent circuit of PV cell and its I-V & P-V characteristics.
2	To understand the concept of Wind Energy Conversion & its applications.
3	To study the principles of biomass, hydel and geothermal energy.
4	To understand the principles of ocean Thermal Energy Conversion, waves and power associated with it.
5	To study the various chemical energy sources such as fuel cell and hydrogen energy along with their operation and equivalent circuit.

COURSE OUTCOMES		**Cognitive Level**
Upon successful completion of the course, the student will be able to:		
CO1	Analyze solar radiation data, extra-terrestrial radiation, radiation on earth's surface and solar Energy Storage.	K4
CO2	Illustrate the components of wind energy systems.	K3
CO3	Illustrate the working of biomass, hydel plants and Geothermal plants.	K3
CO4	Demonstrate the principle of Energy production from OTEC, Tidal and Waves.	K2
CO5	Evaluate the concept and working of Fuel cells & MHD power generation.	K5

K1- Remembering, K2- Understanding, K3-Applying, K4- Analyzing, K5- Evaluating, K6- Creating

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)													
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**
CO1	3	2	1	-	-	-	**1**	-	-	-	-	3	3
CO2	3	2	1	-	-	-	1	-	-	-	-	2	3
CO3	3	1	1	-	-	-	1	-	-	-	-	2	3
CO4	3	1	1	-	-	-	1	-	-	-	-	3	3
CO5	3	1	1	-	-	-	1	-	-	-	-	2	3

PRAGATI ENGINEERING COLLEGE

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COURSE CONTENT

UNIT 1

Solar Energy

Introduction - Renewable Sources - prospects, solar radiation at the Earth Surface - Equivalent circuit of a Photovoltaic (PV) Cell - I-V & P-V Characteristics - Solar Energy Collectors: Flat plate Collectors, concentrating collectors - Solar Energy storage systems and Applications: Solar Pond - Solar water heating - Solar Green house.

UNIT 2

Wind Energy

Introduction - basic Principles of Wind Energy Conversion, the nature of Wind - the power in the wind - Wind Energy Conversion - Site selection considerations - basic components of Wind Energy Conversion Systems (WECS) - Classification - Applications.

UNIT 3

Biomass, Hydel and Geothermal Energy

Biomass: Introduction - Biomass conversion technologies- Photosynthesis. Factors affecting Bio digestion.

Hydro plants: Basic working principle – Classification of hydro systems: Large, small, micro hydel plants.

Geothermal Energy: Introduction, Geothermal Sources – Applications - operational and Environmental problems.

UNIT 4

Energy From oceans, Waves & Tides

Oceans: Introduction - Ocean Thermal Electric Conversion (OTEC) – methods - prospects of OTEC in India.

Waves: Introduction - Energy and Power from the waves - Wave Energy conversion devices.

Tides: Basic principle of Tide Energy -Components of Tidal Energy.

UNIT 5

Chemical Energy Sources

Fuel Cells: Introduction - Fuel Cell Equivalent Circuit - operation of Fuel cell - types of Fuel Cells - Applications.

Hydrogen Energy: Introduction - Methods of Hydrogen production - Storage and Applications.

Magneto Hydro Dynamic (MHD) Power generation: Principle of Operation - Types.

TEXT BOOKS

1 G.D.Rai, Non-Conventional Energy Sources, Khanna Publications, 2011.

2 John Twidell& Tony Weir, Renewable Energy Sources, Taylor & Francis, 2013.

REFERENCE BOOKS

1 Solar Energy: Principles of Thermal Collection and Storage, S. P. Sukhatme and J. K. Nayak,TMH, New Delhi, 3rd Edition.

2 John Andrews & Nick Jelly, Energy Science- principles, Technologies and Impacts, Oxford, 2nd edition, 2013.

PRAGATI ENGINEERING COLLEGE

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(AUTONOMOUS)

Department of Civil Engineering

III Year I Semester

Sustainable Energy Technologies

Course Category	Open Elective-I	**Course Code**	
Course Type	Theory	**L-T-P-C**	3-0-0-3
Prerequisites	-	**Continuous Internal Assessment** **Semester End Examination** **Total Marks**	30 70 100

COURSE OBJECTIVES	
1	To demonstrate the importance the impact of solar radiation, solar PV modules.
2	To understand the principles of storage in PV systems.
3	To discuss solar energy storage systems and their applications.
4	To get knowledge in wind energy and bio-mass.
5	To gain insights in geothermal energy, ocean energy and fuel cells.

COURSE OUTCOMES		
Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Illustrate solar radiation principles and the design of PV modules.	K3
CO2	Discuss battery technologies and storage methods in PV systems.	K2
CO3	Explain solar energy collection, storage methods, and applications.	K2
CO4	Describe the principles and utilization of wind and bio-mass energy systems.	K2
CO5	Analyze geothermal, ocean, and fuel cell energy technologies.	K4

K1- Remembering, K2- Understanding, K3-Applying, K4- Analyzing, K5- Evaluating, K6- Creating

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

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	1	1	-	-	3	-	-	1	-	2
CO2	3	1	2	-	-	3	-	-	1	-	3
CO3	3	2	2	-	-	3	-	-	1	-	3
CO4	3	1	1	-	-	3	-	-	1	-	3
CO5	3	2	2	-	-	3	-	-	1	-	3

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COURSE CONTENT

UNIT –I

SOLAR RADIATION: Role and potential of new and renewable sources, the solar energy option, Environmental impact of solar power, structure of the sun, the solar constant, sun-earth relationships, coordinate systems and coordinates of the sun, extraterrestrial and terrestrial solar radiation, solar radiation on titled surface, instruments for measuring solar radiation and sun shine, solar radiation data, numerical problems.

SOLAR PV MODULES AND PV SYSTEMS:

PV Module Circuit Design, Module Structure, Packing Density, Interconnections, Mismatch and Temperature Effects, Electrical and Mechanical Insulation, Lifetime of PV Modules, Degradation and Failure, PV Module Parameters, Efficiency of PV Module, Solar PV Systems-Design of Off Grid Solar Power Plant, Installation and Maintenance, Real-time PV monitoring systems, Maximum Power Point Tracking)algorithms in PV systems.

UNIT –II

STORAGE IN PV SYSTEMS:

Battery Operation, Types of Batteries, Battery Parameters, Application and Selection of Batteries for Solar PV System, Battery Maintenance and Measurements, Battery Installation for PV System.

UNIT –III

SOLAR ENERGY COLLECTION: Flat plate and concentrating collectors, classification of concentrating collectors, orientation.

SOLAR ENERGY STORAGE AND APPLICATIONS: Different methods, sensible, latent heat and stratified storage, solar ponds, solar applications- solar heating/cooling technique, solar distillation and drying, solar cookers, central power tower concept and solar chimney, Solar-assisted heat pump systems**.**

UNIT – IV

WIND ENERGY: Sources and potentials, horizontal and vertical axis windmills, performance characteristics, betz criteria, types of winds, wind data measurement.

BIO-MASS: Principles of bio-conversion, anaerobic/aerobic digestion, types of bio-gas digesters, gas yield, utilization for cooking, bio fuels, I.C. engine operation and economic aspects.

UNIT – V

GEOTHERMAL ENERGY: Origin, Applications, Types of Geothermal Resources, Relative Merits

OCEAN ENERGY: Ocean Thermal Energy; Open Cycle & Closed Cycle OTEC Plants, Environmental Impacts, Challenges.

FUEL CELLS: Introduction, Applications, Classification, Different Types of Fuel Cells Such as Phosphoric Acid Fuel Cell, Alkaline Fuel Cell, PEM Fuel Cell, MC Fuel Cell.

Text books:

1. Solar Energy – Principles of Thermal Collection and Storage/Sukhatme S.P. and J.K.Nayak/TMH.
2. Non-Conventional Energy Resources- Khan B.H/ Tata McGraw Hill, New Delhi, 2006.
3. Green Manufacturing Processes and Systems - J. Paulo Davim/Springer 2013.

Reference Books:

1. Principles of Solar Engineering - D.Yogi Goswami, Frank Krieth& John F Kreider / Taylor &Francis.
2. Non-Conventional Energy - Ashok V Desai /New Age International (P) Ltd.
3. Renewable Energy Technologies -Ramesh & Kumar /Narosa.
4. Non-conventional Energy Source- G.D Roy/Standard Publishers.

Web References:

1. https://onlinecourses.nptel.ac.in/noc24_me144/preview
2. https://archive.nptel.ac.in/courses/115/105/115105127/
3. https://archive.nptel.ac.in/courses/121/106/121106014/

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Department of Civil Engineering

III Year I Semester
Introduction to Cloud Computing
(Common to CE, EEE, ME & ECE)

Course Category	**Open Elective - 1**	**Course Code**	
Course Type	Theory	**L-T-P-C**	3-0-0-3
Prerequisites		**Continuous Internal Assessment** **Semester End Examination** **Total Marks**	30 70 100

COURSE OBJECTIVES	
1	To explain the evolving utility computing model called cloud computing.
2	To introduce the various levels of services offered by cloud.
3	To discuss the fundamentals of cloud enabling technologies such as distributed computing, service-oriented architecture and virtualization.
4	To emphasize the security and other challenges in cloud computing.
5	To introduce the advanced concepts such as containers, serverless computing and cloud-centric Internet of Things.

COURSE OUTCOMES		
Up on successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Understand cloud computing fundamentals, service models, and deployment types.	K2
CO2	Understand enabling technologies including distributed systems and virtualization techniques.	K2
CO3	Demonstrate virtualization, containers, and orchestration using modern cloud tools.	K4
CO4	Analyze cloud challenges including security, scalability, and interoperability issues.	K4
CO5	Apply advanced cloud concepts like serverless, IoT, and DevOps.	K2

K1-Remembering,K2-Understanding,K3-Applying,K4-Analyzing,K5-Evaluating,K6-Creating

CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**
CO1	3	3	2	0	2	0	0	0	0	0	0
CO2	3	2	3	0	2	0	0	0	0	0	0
CO3	3	3	3	0	2	0	0	0	0	0	0
CO4	3	3	3	0	3	0	0	0	0	0	0
CO5	3	2	3	0	3	0	0	0	0	0	0

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COURSE CONTENT

UNIT -I: Introduction to Cloud Computing Fundamentals

Cloud computing at a glance, defining a cloud, cloud computing reference model, types of services (IaaS, PaaS, SaaS), cloud deployment models (public, private, hybrid), utility computing, cloud computing characteristics and benefits, cloud service providers (Amazon Web Services, Microsoft Azure, Google AppEngine).

UNIT-II: Cloud Enabling Technologies

Ubiquitous Internet, parallel and distributed computing, elements of parallel computing, hardware architectures for parallel computing (SISD, SIMD, MISD, MIMD), elements of distributed computing, Inter-process communication, technologies for distributed computing, remote procedure calls (RPC), service-oriented architecture (SOA), Web services, virtualization.

UNIT-III: Virtualization and Containers

Characteristics of virtualized environments, taxonomy of virtualization techniques, virtualization and cloud Computing, pros and cons of virtualization, technology examples (XEN, VMware), building blocks of containers, container platforms (LXC, Docker), container orchestration, Docker Swarm and Kubernetes, public cloud VM (e.g. Amazon EC2) and container (e.g. Amazon Elastic Container Service) offerings.

UNIT-IV: Cloud computing challenges

Economics of the cloud, cloud interoperability and standards, scalability and fault tolerance, energy efficiency in clouds, federated clouds, cloud computing security, fundamentals of computer security, cloud security architecture, cloud shared responsibility model, security in cloud deployment models.

UNIT -V: Advanced concepts in cloud computing

Serverless computing, Function-as-a-Service, serverless computing architecture, public cloud (e.g. AWS Lambda) and open-source (e.g. OpenFaaS) serverless platforms, Internet of Things (IoT), applications, cloud-centric IoT and layers, edge and fog computing, DevOps, infrastructure-as-code, quantum cloud computing.

Text Books:

1. Mastering Cloud Computing, 2nd edition, RajkumarBuyya, Christian Vecchiola, ThamaraiSelvi, ShivanandaPoojara, Satish N. Srirama, McGraw Hill, 2024.
2. Distributed and Cloud Computing, Kai Hwang, Geoffery C. Fox, Jack J. Dongarra, Elsevier, 2012.

Reference Books:

1. Cloud Computing, Theory and Practice, Dan C Marinescu, 2nd edition, MK Elsevier, 2018.
2. Essentials of cloud Computing, K. Chandrasekhran, CRC press, 2014.
3. Online documentation and tutorials from cloud service providers (e.g., AWS, Azure, GCP)

e-Resources:https://onlinecourses.nptel.ac.in/noc21_cs14/preview

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III Year – I Semester

Geotechnical Engineering Laboratory

Course Category	Professional Core	**Course Code**	
Course Type	Practical	**L-T-P-C**	0-0-3-1.5
Prerequisites	Soil Mechanics	**Continuous Internal Assessment** **Semester End Examination** **Total Marks**	30 70 100

Course Objectives:	
1.	Impart knowledge of determination of index and engineering properties of soils for their identification and classification
2.	Analyze and interpret laboratory test results to interpret engineering behavior of soils
3.	Design and evaluate geotechnical solutions such as shear and consolidation parameters, construction of roads, embankments, pavements, tunnels, retaining walls etc based on laboratory test results.

Course Outcomes:

Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Determine index and engineering properties of soil through laboratory tests (Application).	**K3**
CO2	Analyze and interpret laboratory test results to understand soil behavior..	**K3**
CO3	Design and evaluate geotechnical solutions based on laboratory test results.	**K3**

K1: Remember, K2: Understand, K3: Apply, K4: Analyze, K5: Evaluate, K6: Create.

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

CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**	**PSO3**
CO1	**2**	-	-	-	-	-	-	-	-	-	-	**2**	-	-
CO2	**3**	**3**	-	-	-	-	-	-	-	-	-	**3**	**3**	-
CO3	**3**	-	**3**	-	-	-	-	-	-	-	-	-	**3**	-

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COURSE CONTENT

LIST OF EXPERIMENTS

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

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

LIST OF EQUIPMENT:

1. Casagrande's liquid limit apparatus.
2. Apparatus for plastic and shrinkage limits
3. Field density apparatus for
   a) Core cutter method b) Sand replacement method
4. Set of sieves: 4.75mm, 2mm, 1mm, 0.6mm, 0.425mm, 0.3mm, 0.15mm, and 0.075mm.
5. Hydrometer
6. Permeability apparatus for
   a) Constant head test b) Variable head test
7. Universal auto compactor for I.S light and heavy compaction tests.
8. Apparatus for CBR test
9. One dimensional consolation test apparatus with all accessories.
10. Triaxial cell with provision for accommodating38 mm dia specimens.
11. Box shear test apparatus
12. Laboratory vane shear apparatus.
13. Hot air ovens (range of temperature 50^0-150^0C)

References:

1. Determination of Soil Properties by J.E.Bowles.
2. IS Code2720 – relevant parts.

Website links:

https://youtube.com/playlist?list=PL3MO67NH2XxKxWtYte3GeJJN8LNQWcJqP&si=1eD4K8Lpzvll6PYZ

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Department of Civil Engineering

III Year – I Semester

Fluid Mechanics And Hydraulic Machines Laboratory

Course Category	Engineering Science	**Course Code**	
Course Type	Theory	**L-T-P-C**	3-0-0-3
Prerequisites		**Continuous Internal Assessment**	30
		Semester End Examination	70
		Total Marks	100

Course Objectives:	
1.	To know the knowledge of various flow meters and the concept of fluid mechanics. Students will compare the performance of various machines at different operating points.
2.	To understand the flow through different channels in Practical conditions.
3.	Useful to learn the Bernoulli's Equation Practical Applications.
4.	Can understand the different hydraulic turbines in power plants.
5.	This lab helps to gain knowledge on working of centrifugal pumps, positive displacement pumps.

Course Outcomes:

Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Perform experiments to determine the coefficient of discharge of flow measuring devices.	K2
CO2	Analyze the flow through rectangular and v-notch and pipe flow losses.	K4
CO3	Verify the Bernoulli's theorem and knowledge on impact of jets.	K2
CO4	Conduct experiments on hydraulic turbines and pumps to draw characteristics	K2
CO5	Examine the centrifugal and reciprocating pumps.	K2

K1: Remember, K2: Understand, K3: Apply, K4: Analyze, K5: Evaluate, K6: Create.

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

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

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COURSE CONTENT

LIST OF EXPERIMENTS:

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

List of Equipment:

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

TEXT BOOKS:

1. Fluid Mechanics and Hydraulic Machines by R. K. Bansal; Laxmi Publications; New Delhi.
2. Hydraulics & Fluid Mechanics by P. N. Modi & S. N. Seth; Standard Book house, New Delhi.

REFERENCE BOOKS:

1. Rajput R.K., Fluid Mechanics and Hydraulic Machines, S.Chand and Company Ltd., 2005.

WEB RESOURCES:

1. http://www.nptelvideos.in/2012/11/fluid-mechanics.html

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Department of Civil Engineering

III Year – I Semester

Estimation, Specification and Contracts

Course Category	Skill Enhancement course	**Course Code**	
Course Type	Theory	**L-T-P-C**	3-0-0-3
Prerequisites		**Continuous Internal Assessment** **Semester End Examination** **Total Marks**	30 70 100

Course Objectives:	
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
4	Understanding Construction Contracts
5	Know the contract management and rate analysis

Course Outcomes:

Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Explain the types of contracts, contract documents, valuation methods, and standard specifications for building construction, including concepts of e-procurement and reverse auctions.	**K2**
CO2	Apply principles of quantity estimation, rate analysis, and preparation of bar bending schedules for different items of work in buildings, roads, and canals.	**K3**
CO3	Prepare detailed estimates for single, double, and four-roomed buildings using both individual wall and center line methods, and *utilize* standard estimation software.	**K4**

K1: Remember, K2: Understand, K3: Apply, K4: Analyze, K5: Evaluate, K6: Create.

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

CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**	**PSO3**
CO1	3	2	1	1	1	2	1	1	2	2	1	3	2	1
CO2	3	3	2	2	2	2	1	1	2	3	2	3	3	1
CO3	2	2	3	2	3	2	1	2	2	3	2	3	3	2

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COURSE CONTENT

UNIT–I

Contracts–Types of contracts–Contract Documents–Conditions of contract, Valuation of buildings-concepts of e-procurement and reverse auctions. Standard specifications for different items of building construction.

UNIT–II

General items of work in Building–Standard Units Principles of working out quantities for detailed and abstract estimates –Approximate method of Estimating.

UNIT–III

Rate Analysis– Working out data for various items of work over head and contingent charges. Earthwork for roads and canals, Reinforcement bar bending and bar requirement schedules**.**

UNIT–IV

Detailed Estimation of Buildings using individual wall method for single, double and four roomed buildings

UNIT–V

Detailed Estimation of Buildings using center line method for single, double and four roomed buildings. Standard software's like building estimator etc.

Text Books:

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

Reference Books:

1. 'Standard Schedule of rates and standard data book' by public works department.
2. IS1200 (PartsItoXXV-1974/ Method of Measurement of Building &Civil Engg Works–B.I.S.)
3. 'Estimation, Costing and Specifications' by M.Chakraborthi; Laxmi publications.
4. National Building Code.

Web Resources:

1. Building cost estimation simplified - Course

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Department of Civil Engineering

III Year I Semester

Salesforce Administrator Explorer

(Common to All Branches)

Course Category	Skill Enhancement Course	**Course Code**	
Course Type	Laboratory	**L-T-P-C**	0-1-2-2
Prerequisites		**Continuous Internal Assessment** **Semester End Examination** **Total Marks**	30 70 100

COURSE OBJECTIVES	
1	Help in collaborating with business and technical stake holders to design, configure, and implement Salesforce
2	Develop a mind set in solving business problems using the Salesforce Platform
3	Hands on practice on provide reporting on a regular basis to help users and executives gain insights and make decisions from Salesforce data
4	Learn how to create human-centered user experiences in Salesforce
5	UnderstandhowtoCreate,maintain,andenhanceautomatedbusinessprocesses

COURSE OUTCOMES		
Up on successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Be able to understand how to manage changes to business processes, technology, and people with Salesforce.	K1
CO2	Be able to improve the efficiency of business operations by proactively undertaking regular process analysis and documentation.	K2
CO3	Be able to manage the end-to-end implementation of Salesforce, including the overall strategy and day-to-day activities involved in administering Salesforce.	K3

K1-Remembering,K2-Understanding,K3-Applying,K4-Analyzing,K5-Evaluating,K6-Creating

CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**
CO1	2	2	2	0	3	1	1	1	2	3	2
CO2	2	3	2	0	2	1	1	1	2	2	1
CO3	3	3	3	0	3	1	1	2	3	3	2

COURSE CONTENT

Experiment 1:

Salesforce Platform Basics: Get Started with the Salesforce Platform, Discover Use Cases for the Platform, Understand the Salesforce Architecture, Navigate Setup, Power Up with AppExchange.

Prepare Your Salesforce Org for Users: Set Up the Exchange Rate, Update the Exchange Rate with ACM, Customize the Home Page, Create a Unique Account List View, Create Chatter Groups.

User Management: Add New Users, Control What Your Users Can Access — (3 Sessions)

Experiment 2:

Customize an Org to Support a New Business Unit: Manage User Access, Manage Chatter, Modify Your Data Model, Configure an Email Letterhead and Template, Automate Your Business Process.

Identity Basics: Get to Know Salesforce Identity, Get to Know Your Salesforce Identity Users, Learn the Language of Identity — (4 Sessions)

Experiment 3:

Data Security: Overview of Data Security, Control Access to the Org, Control Access to Objects, Control Access to Fields, Control Access to Records, Create a Role Hierarchy, Define Sharing Rules.

Permission Set Groups: Get Started with Permission Set Groups, Create a Permission Set Group, Mute Permissions in Permission Set Groups.

Protect Your Data in Salesforce: Restrict Login Hours and IP Ranges, Create New Users and Allow a User to Delete Accounts, Set Organization-Wide Defaults and Create a Role Hierarchy, Create Sharing Rules, Set Up Account Teams — (5 Sessions)

Experiment 4:

Data Modeling: Understand Custom & Standard Objects, Create Object Relationships, Work with Schema Builder.

Lightning Experience Customization: Set Up Your Org, Create and Customize Lightning Apps, Create and Customize List Views, Customize Record Highlights with Compact Layouts, Customize Record Details with Page Layouts, Create Custom Buttons and Links, Empower Your Users with Quick Actions.

Customize a Salesforce Object: Work with Standard and Custom Fields, Create Picklists and Field Dependencies, Create Lookup Filters, Create Formula Fields, Create Record Types, Create Account Page Layouts, Enable Account Field History Tracking, Create Validation Rules — (5 Sessions)

Experiment 5:

Lightning App Builder: Get Started with the Lightning App Builder, Build a Custom Home Page for Lightning Experience, Build a Custom Record Page for Lightning Experience and Salesforce Mobile App, Build an App Home Lightning Page, Work with Custom Lightning Components.

Formulas and Validations: Use Formula Fields, Implement Roll-Up Summary Fields, Create Validation Rules — (4 Sessions)

Experiment 6:

Accounts & Contacts for Lightning Experience: Store Information About Your Customers, Understand Account and Contact Relationships.

Leads & Opportunities for Lightning Experience: Create and Convert Leads as Potential Customers, Work Your Opportunities, Sell as a Team and Split the Credit, Visualize Success with Path and Kanban.

Products, Quotes, & Contracts: Create Price Books to Track Your Products, Configure Quotes for Your Customers, and Track Contracts.

Campaign Basics: Meet Salesforce Campaigns, Organize Campaigns, Determine Who You're Marketing To, Report on Your Campaigns.

Customize a Sales Path for Your Team: Customize a Sales Path, Customize Opportunity Stages, Work with Opportunities in the Kanban View — (5 Sessions)

Experiment 7:

Service Cloud for Lightning Experience: Begin Your Customer Service Journey, Administer Service Cloud, Automate Case Management, Create Digital Engagement on Multiple Channels.

Set Up the Service Console: Set Up the Lightning Service Console, Customize Your Lightning Service Console Pages, Add the Softphone Utility to Your App, Set Up Web Chats for Your Console.

Create a Process for Managing Support Cases: Create Support Processes, Create Record Types, Create an Escalation Rule.

Set Up Case Escalation and Entitlements: Create Support Processes, Create Case Queues and Assignment Rules, Create a Case Escalation Rule, Create an Automation with Flow Builder, Enable Entitlements and Set Up Service Contracts, Create an Entitlement Process, Create Service Contracts with Entitlements — (5 Sessions)

Experiment 8:

Chatter Administration for Lightning Experience: Get Started with Chatter, Work with Chatter Groups, Enable Feed Tracking, Approve Records from a Chatter Feed, Develop a Rollout Strategy.

App Exchange Basics: Get Started with AppExchange, Navigate AppExchange, Explore App Exchange Listings, Install App Exchange Packages, Connect and Contribute to the AppExchange Community — (3 Sessions)

Experiment 9:
Data Management: Import Data, Export Data.
Duplicate Management: Improve Data Quality in Salesforce, Resolve and Prevent Duplicate Data in Salesforce.
Import and Export with Data Management Tools: Use the Data Import Wizard, Use Data Loader.io to Export Data, Use Data Loader.io to Update Data — (3 Sessions)

Experiment 10:
Reports & Dashboards for Lightning Experience: Introduction to Reports and Dashboards in Lightning Experience, Create Reports with the Report Builder, Format Reports, Visualize Your Data with the Lightning Dashboard Builder, Extend Your Reporting Strategy with AppExchange.
Create Reports and Dashboards for Sales and Marketing Managers: Create Report and Dashboard Folders, Create a Simple Custom Report, Filter Your Reports, Group and Categorize Your Data, Use Summary Formulas in Your Reports, Manage Reported Data, Visualize Your Data — (3 Sessions)

Experiment 11:
Approve Records with Approval Processes: Customize How Records Get Approved, Build an Approval Process.
Build a Discount Approval Process: Prepare Your Org, Create an Approval Process, Create Initial Submission Actions, Specify Final Approval and Rejection Actions.
Build a Simple Flow: Collect Contact Info from Your User, Check for a Matching Contact in Your Org, Branch the Flow, Create or Update a Contact.
Flow Builder Basics: Get Started with Automation, Go with the Flow, Meet Flow Builder, Learn About Flow Variables — (3 Sessions)

Experiment 12:
Case Studies and Capstone Project: Complete the Capstone Project by taking a user case and working on the Trailhead Playground — (5 Sessions)

Text Books:

1. Sharif Shaalan and Timothy Royer, *"Salesforce for Beginners: A Step-by-Step Guide to Optimize Sales and Marketing and Automate Business Processes with the Salesforce Platform"*, 2nd Ed, 2022, PACKT Publishers.
2. Sharif Shaalan, *"Salesforce for Beginners: A Step-by-Step Guide to Creating, Managing, and Automating Sales and Marketing Processes"*, 2020, PACKT Publishers.
3. Paul Goodey, *"Salesforce CRM – The Definitive Admin Handbook: Build, Configure, and Customize Salesforce CRM and Mobile Solutions"*, 5th Ed, 2019, PACKT Publishers.
4. Rakesh Gupta, *"Mastering Salesforce CRM Administration"*, 2017, PACKT Publishers.
5. Felicia Duarte, Rachelle Hoffman, *"Learn Salesforce Lightning: The Visual Guide to the Lightning UI"*, 2018, Wiley Apress.

Reference Books:

1. Johan Yu, *"Salesforce Lightning Reporting and Dashboards: Create, Customize, and Manage Your Salesforce Reports and Dashboards in Depth with Lightning Experience"*, 2017, PACKT Publishers.
2. Ahsan Zafar, *"Salesforce Data Architecture and Management: A Pragmatic Guide for Aspiring Salesforce Architects and Developers to Manage, Govern, and Secure Their Data Effectively"*, 2021, PACKT Publishers.
3. Saifullah Saifi and Ashwini Kumar Raj, *"Cloud Computing Using Salesforce"*, 2021, BPB.

e-Resources:

1. Use the Trailhead Platform: https://www.salesforce.com/blog/what-is-trailhead/
2. The Salesforce Administrator Trailmix: https://trailhead.salesforce.com/users/srebello7/trailmixes/salesforce-administrator-explorer

PRAGATI ENGINEERING COLLEGE

R23

(AUTONOMOUS)

Department of Civil Engineering

III Year I Semester
TINKERING LAB
(Common to Civil, EEE & ME)

Course Category		**Course Code**	
Course Type	Laboratory	**L-T-P-C**	0-0-2-1
Prerequisites		**Continuous Internal Assessment** **Semester End Examination** **Total Marks**	30 70 100

COURSE OBJECTIVES	
The student will learn:	
1	Encourage Innovation and Creativity
2	Provide Hands-on Learning
3	Impart Skill Development
4	Foster Collaboration and Teamwork
5	Enable Interdisciplinary Learning
6	Impart Problem-Solving mind-set
7	Prepare for Industry and Entrepreneurship

COURSE OUTCOMES		
Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Build and demonstrate basic electronic circuits and IoT projects using breadboards, sensors, microcontrollers, and simulation tools.	K3
CO2	Apply Arduino, ESP32, and related platforms to develop and control hardware-based applications.	K3
CO3	Design and fabricate mechanical prototypes using 3D printing and apply design thinking for innovative product development.	K4

K1- Remembering, K2- Understanding, K3-Applying, K4- Analyzing, K5- Evaluating, K6- Creating

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)													
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO 1**	**PSO 2**
CO1	3	2											
CO2	3	3											
CO3	3	2											
CO4	3	1											
CO5	3	2											

PRAGATI ENGINEERING COLLEGE

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Department of Civil Engineering

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COURSE CONTENT

These labs bridge the gap between academia and industry, providing students with the practical experience. Some students may also develop entrepreneurial skills, potentially leading to start-ups or innovation-driven careers. Tinkering labs aim to cultivate the next generation of engineers by giving them the tools, space, and mind-set to experiment, innovate, and solve real-world challenges.

List of experiments:

1. Make your own parallel and series circuits using breadboard for any application of your choice.
2. Demonstrate a traffic light circuit using breadboard.
3. Build and demonstrate automatic Street Light using LDR.
4. Simulate the Arduino LED blinking activity in Tinkercad.
5. Build and demonstrate an Arduino LED blinking activity using Arduino IDE.
6. Interfacing IR Sensor and Servo Motor with Arduino.
7. Blink LED using ESP32.
8. LDR Interfacing with ESP32.
9. Control an LED using Mobile App.
10. Design and 3D print a Walking Robot
11. Design and 3D Print a Rocket.
12. Build a live soil moisture monitoring project, and monitor soil moisture levels of a remote plan in your computer dashboard.
13. Demonstrate all the steps in design thinking to redesign a motor bike. Students need to refer to the following links:
    - **i.** https://aim.gov.in/pdf/equipment-manual-pdf.pdf
    - **ii.** https://atl.aim.gov.in/ATL-Equipment-Manual/
    - **iii.** https://aim.gov.in/pdf/Level-1.pdf
    - **iv.** https://aim.gov.in/pdf/Level-2.pdf
    - **v.** https://aim.gov.in/pdf/Level-3.

PRAGATI ENGINEERING COLLEGE

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(AUTONOMOUS)

Department of Civil Engineering

III Year – II Semester

Design and Drawing of Steel Structures

Course Category	Professional Core	**Course Code**	
Course Type	Theory	**L-T-P-C**	3-0-0-3
Prerequisites	Strength of materials Structural Analysis	**Continuous Internal assessment** **Semester End Examination** **Total Marks**	30 70 100

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

Course Outcomes:

Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Design of bolts and welded connections with relevant IS codes	**K3**
CO2	Design of beams and detailing	**K3**
CO3	Design tension and compression members	**K3**
CO4	Design compression members of different types with connection detailing	**K3**
CO5	Design Plate Girder and Gantry Girder with connection detailing	**K3**

K1: Remember, K2: Understand, K3: Apply, K4: Analyze, K5: Evaluate, K6: Create.

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

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

PRAGATI ENGINEERING COLLEGE

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Department of Civil Engineering

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COURSE CONTENT

UNIT – I

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

UNIT – II

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

UNIT –III

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

UNIT – IV

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

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

UNIT – V

Design of Plate Girder: Design consideration – IS Code Recommendations Design of plate girder-Welded – Curtailment of flange plates, stiffeners – splicing and connections**.**

Design of Gantry Girder: impact factors - longitudinal forces, Design of Gantry girders

NOTE: Welding connections should be used in Units II – V. Drawing classes must be conducted every week and the students should prepare the following plates.

Plate 1 Detailing of simple beams
Plate 2 Detailing of Compound beams including curtailment of flange plates.
Plate 3 Detailing of Column including lacing and battens.
Plate 4 Detailing of Column bases – slab base and gusseted base
Plate 5 Detailing of steel roof trusses including joint details.
Plate 6 Detailing of Plate girder including curtailment, splicing and stiffeners.
Plate 7 Detailing of gantry girder.

FINAL EXAMINATION PATTERN:

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

TEXTBOOKS

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

REFERENCES

1. 'Design of Steel Structures' by P. Dayaratnam; S. Chand Publishers
2. 'Design of Steel Structures' by M. Raghupathi, Tata Mc. Graw-Hill

WEB LINKS:

https://tinyurl.com/2vfcprhu

PRAGATI ENGINEERING COLLEGE

R23

(AUTONOMOUS)

Department of Civil Engineering

III Year – II Semester

Highway Engineering

Course Category	Engineering Science	**Course Code**	
Course Type	Theory	**L-T-P-C**	3-0-0-3
Prerequisites		**Continuous Internal Assessment**	30
		Semester End Examination	70
		Total Marks	100

Course Objectives:	
1.	Provide fundamental knowledge of highway planning, alignment, and development in the context of national and rural road network plans
2.	Develop an understanding of geometric design principles, traffic engineering concepts, and materials used in highway construction
3.	Equip students with the ability to analyze and design various components of flexible and rigid pavements based on standard codes and specifications
4.	Foster the skills to evaluate traffic conditions, safety measures, and intersection design for effective traffic management
5.	Enable application of engineering principles, analytical methods, and design procedures to solve real-world highway engineering problems

Course Outcomes:

Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Explain the concepts of highway planning, road classification, and development plans, and interpret factors affecting highway alignment	**K2**
CO2	Apply geometric design principles to determine sight distances, design curves, and other highway cross-sectional elements.	**K3**
CO3	Analyze traffic data, accident statistics, and intersection performance, and design traffic control devices and signals using standard methods	**K4**
CO4	Evaluate the properties of highway materials through standard laboratory tests and select appropriate materials for specific road layers	**K5**
CO5	Design flexible and rigid pavements using empirical, semi-empirical, and mechanistic methods as per IRC guidelines.	**K4**

K1: Remember, K2: Understand, K3: Apply, K4: Analyze, K5: Evaluate, K6: Create.

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

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

PRAGATI ENGINEERING COLLEGE

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Department of Civil Engineering

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COURSE CONTENT

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–Combinationofstresses–Designofslabs–DesignofJoints–IRCmethod–Rigidpavementsfor 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, KadiyaliL.R, Khanna Publishers, NewDelhi
2. Principles of Transportation Engineering, Partha Chakraborty and Animesh Das, PHI Learning Private Limited, Delhi

Web Resources:

1. Geometric Design of Highways - Course

PRAGATI ENGINEERING COLLEGE

R23

(AUTONOMOUS)

Department of Civil Engineering

III Year – II Semester
Environmental Engineering

Course Category	Engineering Science	**Course Code**	
Course Type	Theory	**L-T-P-C**	3-0-0-3
Prerequisites		**Continuous Internal Assessment**	30
		Semester End Examination	70
		Total Marks	100

Course Objectives:	
1.	Outline planning and the design of water supply systems for a community/town/city.
2.	Provide knowledge of water quality requirement for domestic usage and knowledge on design of water distribution network.
3.	Selection of valves and fixture in water distribution systems.
4.	Outline the planning and design of Sewerage System for a community/town/city.
5.	To impart knowledge on waste water treatment and disposal.

Course Outcomes:

Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Plan and design the water and distribution networks and sewerage systems	**K3**
CO2	Able to identify the appropriate source of water based on quality and quality requirements	**K2**
CO3	Various Water Quality Parameters.	**K2**
CO4	Select a suitable treatment for raw water treatment as well as sewage treatment	**K3**
CO5	Decide the manner of disposal of wastewater	**K3**

K1: Remember, K2: Understand, K3: Apply, K4: Analyze, K5: Evaluate, K6: Create.

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

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

PRAGATI ENGINEERING COLLEGE

(AUTONOMOUS)

Department of Civil Engineering

R23

COURSE CONTENT

UNIT–I: Introduction: Importance and Necessity of Protected Water Supply systems. Water borne diseases. Planning of public water supply systems. Per capita demand and factors influencing it, types of water demands and its variations, factors affecting water demand, Design Period, Factors affecting the Design period, estimation of water demand for a town or city, Population Forecasting.
Sources of Water: Various surface and subsurface sources considered for water supply and their comparison- Capacity of storage reservoirs, Conveyance of Water from the source to the point of interest: Gravity and Pressure conduits, Types of Pipes and Pipe joints.

UNIT-II : Quality and Analysis of Water: Physical, Chemical and Biological characteristics of water. Water quality criteria for different uses- Rural, Municipal, Industrial and Agricultural uses. Drinking water quality standards: IS and WHO guidelines.
Distribution of Water: Requirements- Methods of Distribution system, Layouts of Distribution networks, Pressures in the distribution layouts, Analysis of Distribution networks: Hardy Cross and equivalent pipe methods – Appurtenances of water distribution system–Laying and testing of pipe lines.

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

UNIT-IV: Planning and Design of Sewerage System
Characteristics and composition of sewage — population equivalent -Sanitary sewage flow estimation — Sewer materials — Hydraulics of flow in sanitary sewers — Sewer design — Storm drainage-Storm runoff estimation — sewer appurtenances — corrosion in sewers — prevention and control — sewage pumping-drainage in buildings-plumbing systems for drainage **Primary Treatment of Sewage**
Objectives — Unit Operations and Processes — Selection of treatment processes — Onsite sanitation — Septic tank-Grey water harvesting — Primary treatment — Principles, functions and design of sewage treatment units — screens — grit chamber-primary sedimentation tanks — Construction, Operation and Maintenance aspects.

UNIT–V: Secondary Treatment of Sewage
Objectives — Selection of Treatment Methods — Principles, Functions, — Activated Sludge Process and Extended aeration systems -Trickling filters– Sequencing Batch Reactor (SBR) — Membrane Bioreactor — UASB — Waste Stabilization Ponds — Other treatment methods -Reclamation and Reuse of sewage — Recent Advances in Sewage Treatment — Construction, Operation and Maintenance aspects.
Disposal of Sewage
Standards for– Disposal — Methods — dilution — Mass balance principle — Self purification of river - Oxygen sag curve — de-oxygenation and re-aeration — Streeter–Phelps model — Land disposal — Sewage farming — sodium hazards — Soil dispersion system.

TEXT BOOKS

1. Environmental Engineering – Howard S. Peavy, Donald R. Rowe, Teorge George Techo banoglus – McGraw- Hill Book Company, New Delhi, 1985.
2. Water Supply Engineering. Dr. P.N. Modi, Standard Book House, Delhi.

REFERENCES

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

WEB REFERENCES

1. **NPTEL : NOC:Introduction to Environmental Engineering and Science - Fundamental and Sustainability Concepts (Multi-Disciplinary)**

PRAGATI ENGINEERING COLLEGE

R23

(AUTONOMOUS)

Department of Civil Engineering

III Year – II Semester

Ground Improvement Techniques

Course Category	Professional Elective-II	**Course Code**	
Course Type	Theory	**L-T-P-C**	3-0-0-3
Prerequisites	Soil Mechanics	**Continuous Internal Assessment**	30
		Semester End Examination	70
		Total Marks	100

Course Objectives:	
1.	To make the student understand the need of densification of soils and various methods of soil densification
2.	To make the student understand purpose of dewatering and different methods of dewatering for improving soil properties
3.	To make the students to know the importance of soil stabilization and different materials used for stabilization. Also students learn the concepts, purposes and effects of grouting for improving soil properties.
4.	To make the student understand how the reinforced earth technology and soil nailing can obviate the problems posed by the conventional retaining walls.
5.	To enable the students to know how geotextiles and geo synthetics can be used to improve the engineering performance of soils.

Course Outcomes:

Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Apply the knowledge of various methods of soil densification for their suitability to different field situations.	**K3**
CO2	Apply the knowledge of dewatering techniques to design for simple cases.	**K3**
CO3	Apply the concepts and applications of soil stabilization and grouting to improve soil properties.	**K3**
CO4	Designs about forced earth embankment and checks its stability based on reinforced earth technology and soil nailing.	**K4**
CO5	Apply the concepts and various functions of geosynthetics and their applications for geotechnical solutions in Civil Engineering practice.	**K3**

K1: Remember, K2: Understand, K3: Apply, K4: Analyze, K5: Evaluate, K6: Create.

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

CO	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO1 0**	**PO1 1**	**PSO 1**	**PSO 2**	**PSO3**
CO1	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**-**	**-**
CO2	**3**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**-**	**-**
CO3	**2**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**-**	**-**
CO4	**3**	**-**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**-**
CO5	**3**	**3**	**-**	**-**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**2**	**-**

PRAGATI ENGINEERING COLLEGE

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Department of Civil Engineering

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COURSE CONTENT

UNIT – I

In situ densification methods- in situ densification of granular soils- vibration at ground surface and at depth, impact at ground and at depth – insitu densification of cohesive soils – pre loading – vertical drains – sand drains and geo drains – stone columns.

UNIT-II

Dewatering–sumps and interceptor ditches –single and multi-stage well points–vacuum well points, horizontal wells – criteria for choice of filler material around drains – electro osmosis

UNIT- III

Stabilization of soils – methods of soil stabilization – mechanical – cement – lime – bitumen and polymer stabilization–use of industrial wastes like fly ash and granulated blast furnace slag.

Grouting – objectives of grouting – grouts and their applications – methods of grouting – stage of grouting– hydraulic fracturing in soils and rocks –post grout tests. Introduction to liquefaction of soils and its effects and applications.

UNIT-IV

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

UNIT-V

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

TEXTBOOKS:

1. 'Ground Improvement Techniques' by Purushotham Raj, Laxmi Publications, New Delhi.
2. 'Ground Improvement Techniques' by Nihar Ranjan Patro, Vikas Publishing House (p) limited, New Delhi.
3. 'An introduction to Soil Reinforcement and Geosynthetics' by G.L.SivaKumar Babu, Universities Press.

REFERENCEBOOKS:

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

Web References:

1. Ground Improvement - Course

PRAGATI ENGINEERING COLLEGE

R23

(AUTONOMOUS)

Department of Civil Engineering

III Year – II Semester

Repair and Rehabilitation of Structures

Course Category	Engineering Science	**Course Code**	
Course Type	Theory	**L-T-P-C**	3-0-0-3
Prerequisites		**Continuous Internal Assessment** **Semester End Examination** **Total Marks**	30 70 100

Course Objectives:	
1.	To introduce the concepts, materials, and admixtures used in the repair and rehabilitation of concrete structures, including their properties, chemical composition, and functional roles.
2.	To develop understanding of nondestructive evaluation (NDE) techniques for assessing deterioration, corrosion, and damage in structural components.
3.	To provide knowledge of strengthening and stabilization methods for structural members such as beams, columns, connections, and cracks.
4.	To impart technical skills in bonded installation techniques using FRP, steel plates, and other composite materials, including analysis of debonding mechanisms.
5.	To familiarize students with the properties, design, and applications of special concretes such as fiber reinforced, lightweight, fly ash, high-performance, and self-consolidating concretes for durable construction.

Course Outcomes:

Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Impart knowledge on materials, admixtures, and modern techniques used in the repair and rehabilitation of structures.	**K2**
CO2	Apply nondestructive evaluation (NDE) techniques to assess concrete deterioration, corrosion, and other damage mechanisms	**K2**
CO3	Analyze strengthening and stabilization techniques for beams, columns, connections, and cracks based on structural requirements	**K3**
CO4	Evaluate bonded installation techniques using FRP and plates, understanding debonding mechanisms and mitigation strategies	**K3**
CO5	Design and assess special concretes (fiber-reinforced, lightweight, fly ash, high-performance, self-consolidating) for durability and performance	**K3**

K1: Remember, K2: Understand, K3: Apply, K4: Analyze, K5: Evaluate, K6: Create.

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

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

PRAGATI ENGINEERING COLLEGE

(AUTONOMOUS)

Department of Civil Engineering

R23

COURSE CONTENT

UNIT–I

Materials for repair and rehabilitation-Admixtures-types of admixtures-purposes of using admixtures-chemical composition-Natural admixtures-Fibers-wraps-Glass and Carbon fiber wraps-Steel Plates-Nondestructive evaluation :Importance-Concrete behavior under corrosion, disintegrated mechanisms- moisture effects and thermal effects – Visual investigation- Acoustical emission methods-Corrosion activity measurement- chloride content–Depth of carbonation-Impact echo methods-Ultra sound pulse velocity methods- pull out tests.

UNIT–II

General items of work in Building–Standard Units Principles of working out quantities for detailed and abstract estimates –Approximate method of Estima 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 stabilizationing

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 post grout tests. Introduction to Liquefaction& its effects & applications**.**

UNIT–IV

Fiber reinforced concrete-Properties of constituent materials-Mix proportions, mixing and casting methods-Mechanical properties of fiber reinforced concrete-applications of fiber reinforced concretes-Light weight concrete-properties of light weight concrete-No fines concrete-design of light weight concrete-Fly ash concrete-Introduction-classification of fly ash-properties and reaction mechanism of fly ash-Properties of fly ash concrete in fresh state and hardened state-Durability of fly ash concretes

UNIT–V

High performance concretes-Introduction-Development of high-performance concretes- Materials of high-performance concretes-Properties of high-performance concretes-Self Consolidating concrete-properties-qualifications.

Text Books:

1. Maintenance Repair Rehabilitation & Minor works of Buildings-P.C.Varghese, PHI Publications
2. Repair and Rehabilitation of Concrete Structures–P.I.Modi, C.N.Patel, PHI Publications
3. Rehabilitation of Concrete Structures - B.Vidivelli, Standard Publishers Distributors
4. Concrete Bridge Practice Construction Maintenance & Rehabilitation- V.K.Raina, Shroff Publishers and Distributors.

Reference Books:

1. Concrete Technology Theory and Practice - M.S.Shetty, SChand and Company
2. Concrete Repair and Maintenance illustrated-Peter HEmmons
3. Concrete Chemical Theory and Applications-Santa KumarA.R., Indian Society for Construction Engineering and Technology, Madras

Web links:

1. Retrofitting and Rehabilitation of Civil Infrastructure - Course

PRAGATI ENGINEERING COLLEGE

R23

(AUTONOMOUS)

Department of Civil Engineering

III Year – II Semester

Valuation and Quantity Survey

Course Category	Engineering Science	**Course Code**	
Course Type	Theory	**L-T-P-C**	3-0-0-3
Prerequisites		**Continuous Internal Assessment** **Semester End Examination** **Total Marks**	30 70 100

Course Objectives:	
1.	To introduce the fundamental principles and scope of Quantity Surveying, including the roles and responsibilities of a quantity surveyor at different stages of construction projects.
2.	To familiarize students with various types of estimates, purposes, cost components, contract documents, and measurement rules as per IS 1200 standards.
3.	To develop skills in preparing detailed estimates, bill of quantities (BOQ), and material quantity calculations for different types of buildings using standard methods.
4.	To train students in using CPWD schedule of rates (DSR) and Detailed Analysis of Rates (DAR) for various construction works in accordance with CPWD specifications.
5.	To impart knowledge of bar bending schedules for RCC structural elements and estimation of roads, sanitary, and water supply works.

Course Outcomes:

Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Explain the basic principles, scope, and responsibilities of a quantity surveyor, along with various types of estimates, cost components, and contract documents	**K2**
CO2	Interpret and apply IS 1200 standards, units of measurement, and methods of measurement for various construction materials and works	**K2**
CO3	Utilize CPWD Schedule of Rates (DSR) and Detailed Analysis of Rates (DAR) to prepare rate analysis and specifications for building works	**K3**
CO4	Prepare detailed estimates, bill of quantities, and material quantity calculations for RCC buildings using standard estimation methods	**K3**
CO5	Develop bar bending schedules for structural members and prepare estimates for roads, sanitary, and water supply works	**K3**

K1: Remember, K2: Understand, K3: Apply, K4: Analyze, K5: Evaluate, K6: Create.

Contribution of Course Outcomes towards achievement of Program Outcomes : (1 – Low, 2 - Medium, 3 – High)														
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**	**PSO3**
CO1	3	2	2	1	1	1	1	1	1	2	1	2	3	2
CO2	3	2	3	2	2	1	1	1	1	2	1	2	3	3
CO3	3	2	3	2	2	1	1	1	1	2	1	2	3	3
CO4	3	2	3	2	2	1	1	1	1	2	1	2	3	3
CO5	3	2	3	3	2	1	1	1	1	2	1	2	1	2

PRAGATI ENGINEERING COLLEGE

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Department of Civil Engineering

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COURSE CONTENT

UNIT–I

Introduction- Quantity Surveying- Basic principles, Role/responsibility of Quantity surveyor at various stages of construction. Estimate - Details required, Type of estimate, purposes. Contingencies, Work-charge establishment, Tools and Plant, centage charge, Day work, Prime cost, Provisional sum & provisional Quantity, Overhead charges, Cost index, Contract documents (Brief description only)Bill of Quantity-Typical format-use Item of works- Identify various item of work from the drawings-units of measurement of various materials and works (focus may give to RCC residential building) General rule & method of measurement with reference to Indian Standard Specifications-IS1200.

UNIT–II

Introduction to the use of CPWD schedule of rates as per latest DSR and Analysis of rate as per latest DAR. Specifications – General specification of all items of a residential building. Detailed specification (CPWD specifications) of major item of work like Earth work excavation in foundation, masonry, Reinforced cement concrete, finishing of building work Analysis of rates for Earth work in excavation for foundation, mortars, reinforced cement concrete Works, finishing work, masonry work, stone works, flooring with reference to latest DSR and latest DAR (Data should be given).

UNIT–III

Detailed Estimate- Preparation of detailed measurement using Centre line method & Short wall long wall (separate wall) method for RCC single storied building (Flat roof) including stair cabin- Residential/office/school building. BOQ preparation of a single storied RCC building work. Material quantity calculation of the items of work (Rubble, Brick work, Concrete work, Plastering) in detailed estimate prepared for building work. (Data for unit quantity should be provided from DAR)

UNIT–IV

Bar Bending Schedule- Preparation of BBS of RCC beams, slabs, Column footings, Retaining wall. Roadestimation-Estimationofearthworkfromlongitudinalsection-metaledroad.Estimation of sanitary and water supply work -Water tank, Septic tank, Manhole *(No Detailed estimate needed-concept of item of work, its general specification and unit of measurement*).(Valuation – purpose, factor affecting, introduction to terms-Value, Cost, Price, kinds of values Income- Gross income, net income, outgoings, annuity, sinking fund, Year's purchase, Depreciation, obsolescence - Free hold and leasehold properties.)

UNIT–V

Methods of calculating depreciation – straight line method – constant percentage method, sinking fund method and quantity survey method.

Methods of valuation–rental method, direct comparison of capital cost, valuation based on profit, depreciation method. Various method of valuation of land (Brief description only)

Text Books:

1. Rangwala, Estimation Costing and Valuation, Charotar publishing house pvt.ltd
2. Dr. S. Seetha Raman, M.Chinna swami, Estimation and quantity surveying, Anuradha publications Chennai.
3. M Chakraborthy, Estimating, Costing, Specification and valuation, published by the author, 21 B, Babanda Road, Calcutta 26

Reference Books:

1. BS Patil, Civil Engineering contracts and estimates, university press
2. VNVazirani&SPChandola, Civil Engineering Estimation and Costing, Khanna Publishers
3. IS1200-1968; Methods of measurement of building & civil engineering works
4. CPWDDAR2018andDSR2018orlatest

Web references:

1. Building cost estimation simplified - Course

PRAGATI ENGINEERING COLLEGE

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(AUTONOMOUS)

Department of Civil Engineering

III Year – II Semester
PROFESSIONAL ELECTIVE – II

Any of the 12- Week Swayam / NPTEL (MOOCs)

1. Sustainable Transportation Systems
   https://onlinecourses.nptel.ac.in/noc25_ce79/preview

2. Pavement Materials (Under Pavement Engineering)
   https://onlinecourses.nptel.ac.in/noc25_ce81/preview

3. Underground Space Technology
   https://onlinecourses.nptel.ac.in/noc25_ce83/preview

PRAGATI ENGINEERING COLLEGE

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(AUTONOMOUS)

Department of Civil Engineering

III Year– II Semester

Finite Element Method

Course Category	Professional Elective-III	**Course Code**	
Course Type	Theory	**L-T-P-C**	3-0-0-3
Prerequisites	Theory of elasticity Mathematics	**Continuous Internal assessment** **Semester End Examination** **Total Marks**	30 70 100

Course Objectives: At the end of the course, the student will be able to:	
1.	Introduce the Fundamentals of Finite Element Method (FEM)
2.	Explain the Mathematical Formulation of Finite Element Models
3.	Develop Proficiency in Stiffness Matrix Computation
4.	Introduce FEM Software Tools
5.	Interpret and Analyze Results from FEM Simulations

Course Outcomes:

Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Explain the principles of the stiffness method, stationary potential energy, and functional approximation techniques in structural analysis.	**K2**
CO2	Develop finite element formulations for truss elements, including stiffness matrices, transformation matrices, and stress computations using Galerkin's method.	**K3**
CO3	Formulate beam element stiffness matrices and perform analysis for various loading conditions, orientations, and support configurations.	**K4**
CO4	Apply finite element methods for plane stress, plane strain, and axisymmetric problems using CST and LST elements, and interpret stress results.	**K3**
CO5	Analyze iso-parametric elements, evaluate stiffness matrices using Gauss quadrature, and assess element stability through patch tests.	**K4**

K1: Remember, K2: Understand, K3: Apply, K4: Analyze, K5: Evaluate, K6: Create.

Contribution of Course Outcomes towards achievement of Program Outcomes : (1 – Low, 2 - Medium, 3 – High)														
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**	**PSO3**
CO1	3	3	2	2	2	1	-	1	1	1	2	3	2	1
CO2	3	3	3	2	3	1	-	1	1	2	2	3	3	1
CO3	3	3	3	3	3	1	-	1	1	2	2	3	3	1
CO4	3	3	2	3	3	1	-	1	1	2	3	2	3	2
CO5	3	3	3	3	3	1	-	1	1	2	3	2	3	2

PRAGATI ENGINEERING COLLEGE

(AUTONOMOUS)

Department of Civil Engineering

R23

COURSE CONTENT

UNIT–I

Introduction: Review of stiffness method-Principle of Stationary potential energy-Potential energy of an elastic body-Rayleigh-Ritz method of functional approximation-variation approaches- weighted residual methods

UNIT-II

Finite Element formulation of truss element: Stiffness matrix-properties of stiffness matrix –Selection of approximate displacement functions-solution of a plane truss-transformation matrix and stiffness matrix for a 3-D truss- Inclined and skewed supports- Galerkin's method for 1-D truss– Computation of stress in a truss element

UNIT-III

Finite element formulation of Beam elements: Beam stiffness – assembleage of beam stiffen matrix- Examples of beam analysis for concentrated and distributed loading-Galerkin's method – 2 Darbitrarily oriented beam element– inclined and skewed supports–rigidplane frame examples

UNIT – IV

Finite element formulation for plane stress, plane strain and axi symmetric problems-Derivation of CST and LST stiffness matrix and equations-treatment of body and surface forces-Finite Element solution for plane stress and axi-symmetric problems-comparison of CST and LST elements– convergence of solution-interpretation of stresses

UNIT – V

Iso-parametric Formulation: Iso-parametric bar element- plane bilinear Iso-parametric element – quadratic plane element-shape functions, evaluation of stiffness matrix, consistent modal load vector- Gauss quadrature-appropriate order of quadrature–element and mesh instabilities–spurious zero energy modes, stress computation-patch test.

Text Books:

1. A first course in the Finite Element Method – Dary l L. Logan, Thomson Publications.
2. Concepts and applications of Finite Element Analysis–Robert D.Cook, Michael EPlesha, John Wiley & Sons Publications

References:

1. Introduction to Finite Elements in Engineering-TirupatiR.Chandrupatla, Ashok D. Belgunda, PHI publications.
2. Finite Element Methods (For Structural Engineers)WailNRifaie, Ashok K Govil, New Age International (P) Limited

Web References:

1. Finite Element Method - Course

PRAGATI ENGINEERING COLLEGE

R23

(AUTONOMOUS)

Department of Civil Engineering

III Year – II Semester

Bridge Engineering

Course Category	Professional Elective-III	**Course Code**	
Course Type	Theory	**L-T-P-C**	3-0-0-3
Prerequisites		**Continuous Internal Assessment** **Semester End Examination** **Total Marks**	30 70 100

Course Objectives:	
1.	Familiarize students with different types of Bridges and IRC standards
2.	Equip student with the concepts and design of Slab Bridges, T Beam Bridges, Box Culverts
3.	Understand concepts of design of Plate Girder Bridges
4.	Familiarize with different methods of inspection of bridges and their maintenance
5.	Analyze and design box culverts, including loading and reinforcement detailing.

Course Outcomes:

Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Identify and classify various types of bridges such as slab, T-beam, arch, cable-stayed, prestressed concrete, truss bridges, and culverts.	**K2**
CO2	Apply effective width methods to calculate wheel load distribution on slab bridges.	**K2**
CO3	Analyze and design structural elements of T-beam bridges including deck slabs, longitudinal girders, and secondary beams.	**K4**
CO4	Solve design problems involving plate girders and produce detailed reinforcement drawings.	**K3**
CO5	Analyze and design box culverts under various loading conditions and prepare reinforcement detailing.	**K4**

K1: Remember, K2: Understand, K3: Apply, K4: Analyze, K5: Evaluate, K6: Create.

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

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

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COURSE CONTENT

UNIT–I

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

UNIT–II

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

UNIT–III

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

UNIT–IV

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

UNIT–V

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

Text Books:

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

Reference Books:

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

Web Resources:

1. nptel.ac.in/courses/105105216

PRAGATI ENGINEERING COLLEGE

R23

(AUTONOMOUS)

Department of Civil Engineering

III Year – II Semester

Water Resource Engineering

Course Category	Professional Elective-III	**Course Code**	
Course Type	Theory	**L-T-P-C**	3-0-0-3
Prerequisites		**Continuous Internal Assessment** **Semester End Examination** **Total Marks**	30 70 100

Course Objectives:	
1.	Understand the concepts of planning and design of irrigation systems.
2.	Understand design principles of erodible and non-erodible canals.
3.	Know the principles of design of weirs on permeable foundations.
4.	Know the concepts for analysis and design of storage head works.
5.	Learn design principles of canal structures.

Course Outcomes:

Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Understand the necessity and importance of irrigation in agriculture and its impact on crop productivity..	**K2**
CO2	Understand and apply Kennedy's and Lacey's theories for canal design.	**K2**
CO3	Describe the types and functions of falls, regulators**,** cross drainage works, and outlets**.**	**K3**
CO4	Design impervious floors and calculate exit gradients for subsurface flow.	**K3**
CO5	Classify and design gravity and earth dams, including stability analysis and seepage control..	**K3**

K1: Remember, K2: Understand, K3: Apply, K4: Analyze, K5: Evaluate, K6: Create.

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

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

COURSE CONTENT

UNIT–I

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

UNIT–II

Canals: Classification, design of non-erodible canals - methods of economic section and maximum permissible velocity, economics of canal lining, design of erodible canals Kennedy's silt theory and Lacey's regime theory, balancing depth of cutting.

UNIT–III

Canal Structures: Falls: Types and location, design principles of Sarda type fall and straight glacis fall. (Description only) Regulators: Head and cross regulators, design principles (Description only)

Cross Drainage Works: Types, selection, design principles of aqueduct, siphon aqueduct and super passage. (Description only) Outlets: Types, proportionality, sensitivity and flexibility River Training: Objectives and approaches

UNIT–IV

Diversion Head Works: Types of diversion head works, weirs and barrages, layout of diversion head works, components. causes and failures of weirs on permeable foundations, Bligh's creep theory, Khosla's theory, design of impervious floors for subsurface flow, exit gradient.

UNIT–V

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

Dams: Types of dams, selection of type of dam, selection of site for a dam. Gravity dams: Forces acting on a gravity dam, causes of failure of a gravity dam, elementary profile and practical profile of a gravity dam, limiting height of a dam, stability analysis. Earth Dams: Types, causes of failure, criteria for safe design, seepage, measures for control of seepage-filters.

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

Text Books:

1. 1.'Irrigation and Waterpower Engineering' by Punmia B C, P.B.B Lal, A.K. Jain and A.K. Jain (2009), Laxmi Publications Pvt. Ltd., New Delhi
2. **'**Irrigation and Water Resources Engineering' by Asawa G L (2013), New Age International Publishers
3. 'Irrigation Engineering' by Raghunath H.M (2012), Wiley India.
4. 'Irrigation Water Resources and Waterpower Engineering' by Modi P N (2011), Standard Book House, New Delhi

Reference Books:

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

Web Resources:

1. nptel.ac.in/courses/105104103

PRAGATI ENGINEERING COLLEGE

(AUTONOMOUS)

Department of Civil Engineering

R23

III Year – II Semester
PROFESSIONAL ELECTIVE – III

Any of the 12- Week Swayam / NPTEL (MOOCs)

1. Earthquake seismology
   https://onlinecourses.nptel.ac.in/noc25_ce127/preview

2. Integrated waste management for a smart city
   https://onlinecourses.nptel.ac.in/noc25_ce122/preview

3. Introduction to Multimodal Urban Transportation Systems (MUTS)
   https://onlinecourses.nptel.ac.in/noc25_ce113/preview

PRAGATI ENGINEERING COLLEGE

R23

(AUTONOMOUS)

Department of Civil Engineering

III Year II Semester

Fundamentals of Electric Vehicles

(Common to CE, ME, ECE, CSE, IT, CSE-CS, CSE-DS, CSE-AI, CSE-AIML)

Course Category	Open Elective Courses	**Course Code**	
Course Type	Theory	**L-T-P-C**	**3-0-0-3**
Prerequisites	Basic knowledge in Physics, Chemistry and Basics of Electrical and Electronics.	**Internal Assessment** **Semester End Examination** **Total Marks**	**30** **70** **100**

COURSE OBJECTIVES	
1	To familiarize the students with the need and advantages of electric and hybrid electric vehicles.
2	To understand various power converters used in electric vehicles.
3	To be familiar all the different types of motors suitable for electric vehicles.
4	To know various architecture of hybrid electric vehicles.
5	To have knowledge on latest developments in batteries and other storage systems.

COURSE OUTCOMES		
Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Illustrate the use and advantages of different types of electric vehicles.	K2
CO2	Use suitable power converters for EV application.	K2
CO3	Select suitable electric motor for EV power train.	K3
CO4	Design HEV configuration for a specific application.	K3
CO5	Analyse various storage systems and battery management system for EVs.	K4

K1- Remembering, K2- Understanding, K3-Applying, K4- Analyzing, K5- Evaluating, K6- Creating

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)													
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**
CO1	1	-	-	-	-	2	2	-	-	-	2	1	1
CO2	2	3	-	-	-	1	1	-	-	-	-	2	2
CO3	-	3	-	-	-	1	-	-	-	2	2	1	2
CO4	3	2	-	-	-	2	1	-	-	2	-	1	2
CO5	2	-	-	-	-	2	-	-	-	-	2	2	2

PRAGATI ENGINEERING COLLEGE

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Department of Civil Engineering

R23

COURSE CONTENT

UNIT 1

Fundamentals of vehicles: Vehicle model – Calculation road load and tractive force – Components of conventional vehicles – Drawbacks of conventional vehicles – Need for electric vehicles– Advantages and applications of Electric Vehicles – History of Electric Vehicles – EV Market in India and outside India – Types of Electric Vehicles.

UNIT 2

Components of Electric Vehicles

Main components of Electric Vehicles – Electric Traction Motor and Controller – Power Converters – Rectifiers used in EVs – Bidirectional DC–DC Converters – Voltage Source Inverters – PWM inverters used in EVs.

UNIT 3

Motors for Electric Vehicles

Characteristics of traction drive – requirements of electric machines for EVs – Comparison of Different motors for Electric and Hybrid Vehicles – Induction Motors – Synchronous Motors – Permanent Magnetic Synchronous Motors – Brushless DC Motors – Switched Reluctance Motors (Construction details and working only).

UNIT 4

Hybrid Electric Vehicles

Evolution of Hybrid Electric Vehicles – Advantages and Applications of Hybrid Electric Vehicles – Architecture of HEVs – Series and Parallel HEVs – Complex HEVs – Range extended HEVs – Examples – Merits and Demerits.

UNIT 5

Energy Sources for Electric Vehicles

Batteries– Types of Batteries – Lithium-ion – Nickel-metal hydride – Lead-acid – Comparison of Batteries – Battery Charging – Fast Charging –Battery Management System – Ultra capacitors – Flywheels – Compressed air energy storage (CAES)– Fuel Cell – it's working.

TEXT BOOKS

1 Iqbal Hussein - Electric and Hybrid Vehicles: Design Fundamentals - CRC Press - 2021.

2 Tom Denton, Hayley Pells - Electric and hybrid vehicles, Third Edition, 2024

REFERENCE BOOKS

1 Kumar - L. Ashok - and S. Albert Alexander. Power Converters for Electric Vehicles. CRC Press - 2020.

2 Chau - Kwok Tong. Electric vehicle machines and drives: design – analysis and application. John Wiley & Sons - 2015.

3 Berg - Helena. Batteries for electric vehicles: materials and electrochemistry. Cambridge university press - 2015.

WEB RESOURCES (Suggested)

1 https://www.edx.org/learn/electric-cars

PRAGATI ENGINEERING COLLEGE

(AUTONOMOUS)

Department of Civil Engineering

R23

III Year II Semester
Additive Manufacturing

Course Category	Open Elective -II	**Course Code**	
Course Type	Theory	**L-T-P-C**	3-0-0-3
Prerequisites	Manufacturing Processes	**Continuous Internal Assessment** **Semester End Examination** **Total Marks**	30 70 100

COURSE OBJECTIVES	
1	To understand the principles of prototyping, classification of Rapid Prototyping processes and liquid-based Rapid Prototyping systems
2	To understand and apply different types of solid-based Rapid Prototyping systems.
3	To understand and apply different types of powder-based Rapid Prototyping systems.
4	To understand and apply various rapid tooling techniques
5	To understand different types of data formats and to explore the applications of Additive Manufacturing processes in various fields.

COURSE OUTCOMES		
Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Explain the principles, classification, and operation of liquid-based Rapid Prototyping systems.	K2
CO2	Describe various solid-based Rapid Prototyping systems.	K2
CO3	Analyze different powder-based Rapid Prototyping systems.	K4
CO4	Apply direct and indirect rapid tooling techniques.	K3
CO5	Interpret Rapid Prototyping data formats and applications of Additive Manufacturing.	K3

K1- Remembering, K2- Understanding, K3-Applying, K4- Analyzing, K5- Evaluating, K6- Creating

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

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

PRAGATI ENGINEERING COLLEGE

(AUTONOMOUS)

Department of Civil Engineering

R23

COURSE CONTENT

UNIT –I

INTRODUCTION: Prototyping fundamentals, historical development, fundamentals of rapid prototyping, advantages and limitations of rapid prototyping, commonly used terms, classification of RP process.

LIQUID-BASED RAPID PROTOTYPING SYSTEMS: Stereo lithography Apparatus (SLA): models and specifications, process, working principle, photopolymers, photo polymerization, layering technology, laser and laser scanning, applications, advantages and disadvantages, case studies. Solid Ground Curing (SGC): models and specifications, process, working principle, applications, advantages and disadvantages, case studies.

UNIT –II

SOLID-BASED RAPID PROTOTYPING SYSTEMS: Laminated object manufacturing (LOM) - models and specifications, process, working principle, applications, advantages and disadvantages, case studies. Fused deposition modeling (FDM) - models and specifications, process, working principle, applications, advantages and disadvantages, case studies.

UNIT –III

POWDER BASED RAPID PROTOTYPING SYSTEMS: Selective laser sintering (SLS): models and specifications, process, working principle, applications, advantages and disadvantages, case studies. Three-dimensional printing (3DP): models and specifications, process, working principle, applications, advantages and disadvantages, case studies.

UNIT – IV

RAPID TOOLING: Introduction to rapid tooling (RT), conventional tooling Vs RT, Need for RT. rapid tooling classification: indirect rapid tooling methods: spray metal deposition, RTV epoxy tools, Ceramic tools, investment casting, spin casting, die casting, sand casting process. Direct rapid tooling: Direct AIM, LOM Tools, and Direct Metal Tooling using 3DP

UNIT – V

RAPID PROTOTYPING DATA FORMATS: STL Format, STL File Problems, consequence of building valid and invalid tessellated models, STL file Repairs: Generic Solution, other Translators, and Newly Proposed Formats.

RP APPLICATIONS: Application in engineering, analysis and planning, aerospace industry, automotive industry, jewelry industry, coin industry, GIS application, RP medical and bioengineering applications: customized implants and prosthesis, forensic sciences.

Textbooks:

1. Rapid prototyping: Principles and Applications /Chua C.K., Leong K.F. and LIM C.S/World Scientific publications
2. Gebhardt A., “Rapid prototyping”, Hanser Gardener Publications, 2003

Reference Books:

1. Liou L.W. and Liou F.W., “Rapid Prototyping and Engineering applications: A tool box for prototype development”, CRC Press, 2007.
2. Rapid Manufacturing / D.T. Pham and S.S. Dimov/Springer
3. Rapid Prototyping & Manufacturing / Paul F.Jacobs/ASME Press

Web References:

1. https://www.ijeast.com/papers/254-260,Tesma505,IJEAST.pdf
2. https://theswissbay.ch/pdf/Books/Survival/Workshop/Rapid%20Tooling%20Technologies%20%26%20Industrial%20Applications.pdf
3. https://www.scribd.com/document/410103053/Patri-K-Venuvinod-Weiyin-Ma-auth-Rapid-Prototyping-Laser-based-and-Other-Technologies-Springer-US-2004-pdf
4. https://onlinecourses.nptel.ac.in/noc25_me151/preview

PRAGATI ENGINEERING COLLEGE

R23

(AUTONOMOUS)

Department of Civil Engineering

III Year II Semester
Object Oriented Programming Through Java
(Common to CE, EEE, ME & ECE)

Course Category	**Open Elective - II**	**Course Code**	
Course Type	Theory	**L-T-P-C**	3-0-0-3
Prerequisites		**Continuous Internal Assessment** **Semester End Examination** **Total Marks**	30 70 100

COURSEOBJECTIVES	
The learning objectives of this course are to:	
1	Identify Java language components and how they work together in applications
2	Learn the fundamentals of object-oriented programming in Java, including defining classes, invoking methods, using class libraries.
3	Learn how to extend Java classes with inheritance and dynamic binding and how to use exception handling in Java applications
4	Understand how to design applications with threads in Java
5	understand how to use Java APIs for program development

COURSEOUTCOMES		
Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Apply the fundamentals of Java to solve problems	K3
CO2	Differentiate the application of decision and iteration control structures	K2
CO3	Implement classes and method overloading concepts	K3
CO4	Apply the concepts of inheritance and packages	K3
CO5	Implement Java programs using exceptions and multithreading	K3

K1-Remembering,K2-Understanding,K3-Applying,K4-Analyzing,K5-Evaluating,K6-Creating

CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**
CO1	3	3	3	0	3	0	0	0	0	0	0
CO2	3	3	3	0	3	0	0	0	0	0	0
CO3	3	3	3	0	3	0	0	0	0	0	0
CO4	3	3	3	0	3	0	0	0	0	0	0
CO5	3	3	3	0	3	0	0	0	0	0	0

COURSE CONTENT

UNIT I

Object Oriented Programming: Basic concepts, Principles,

Program Structure in Java: Introduction, Writing Simple Java Programs, Elements or Tokens in Java Programs, Java Statements, Command Line Arguments, User Input to Programs, Escape Sequences Comments, Programming Style.

Data Types, Variables, and Operators :Introduction, Data Types in Java, Declaration of Variables, Data Types, Type Casting, Scope of Variable Identifier, Literal Constants, Symbolic Constants, Formatted Output with printf() Method, Static Variables and Methods, Attribute Final, **Introduction to Operators**, Precedence and Associativity of Operators, Assignment Operator (=), Basic Arithmetic Operators, Increment (++) and Decrement (- -) Operators, Ternary Operator, Relational Operators,

Boolean Logical Operators, Bitwise Logical Operators.

Control Statements:Introduction, if Expression, Nested if Expressions, if–else Expressions, Ternary Operator?:, Switch Statement, Iteration Statements, while Expression, do–while Loop, for Loop, Nested for Loop, For–Each for Loop, Break Statement, Continue Statement.

UNIT II

Classes and Objects: Introduction, Class Declaration and Modifiers, Class Members, Declaration of Class Objects, Assigning One Object to Another, Access Control for Class Members, Accessing Private Members of Class, Constructor Methods for Class, Overloaded Constructor Methods, Nested Classes, Final Class and Methods, Passing Arguments by Value and by Reference, Keyword this.

Methods: Introduction, Defining Methods, Overloaded Methods, Overloaded Constructor Methods, Class Objects as Parameters in Methods, Access Control, Recursive Methods, Nesting of Methods, Overriding Methods, Attributes Final and Static.

UNIT III

Arrays: Introduction, Declaration and Initialization of Arrays, Storage of Array in Computer Memory, Accessing Elements of Arrays, Operations on Array Elements, Assigning Array to Another Array, Dynamic Change of Array Size, Sorting of Arrays, Search for Values in Arrays, Class Arrays, Two-dimensional Arrays, Arrays of Varying Lengths, Three-dimensional Arrays, Arrays as Vectors.

Inheritance: Introduction, Process of Inheritance, Types of Inheritances, Universal Super Class-Object Class, Inhibiting Inheritance of Class Using Final, Access Control and Inheritance, Multilevel Inheritance, Application of Keyword Super, Constructor Method and Inheritance, Method Overriding, Dynamic Method Dispatch, Abstract Classes, Interfaces and Inheritance.

Interfaces: Introduction, Declaration of Interface, Implementation of Interface, Multiple Interfaces, Nested Interfaces, Inheritance of Interfaces, Default Methods in Interfaces, Static Methods in Interface, Functional Interfaces, Annotations.

UNIT IV

Packages and Java Library: Introduction, Defining Package, Importing Packages and Classes into Programs, Path and Class Path, Access Control, Packages in Java SE, Java.lang Package and its Classes, Class Object, Enumeration, class Math, Wrapper Classes, Auto-boxing and Auto-unboxing, Java util Classes and Interfaces, Formatter Class, Random Class, Time Package, Class Instant (java.time.Instant), Formatting for Date/Time in Java, Temporal Adjusters Class, Temporal Adjusters Class.

Exception Handling: Introduction, Hierarchy of Standard Exception Classes, Keywords throws and throw, try, catch, and finally Blocks, Multiple Catch Clauses, Class Throwable, Unchecked Exceptions, Checked Exceptions.

Java I/O and File: Java I/O API, standard I/O streams, types, Byte streams, Character streams, Scanner class, Files in Java(Text Book 2)

UNIT V

String Handling in Java: Introduction, Interface Char Sequence, Class String, Methods for Extracting Characters from Strings, Comparison, Modifying, Searching; Class String Buffer.

Multithreaded Programming: Introduction, Need for Multiple Threads Multithreaded Programming for Multi-core Processor, Thread Class, Main Thread-Creation of New Threads, Thread States, Thread Priority-Synchronization, Deadlock and Race Situations, Inter-thread Communication - Suspending, Resuming, and Stopping of Threads. **Java Database Connectivity:** Introduction, JDBC Architecture, Installing MySQL and MySQL Connector/J, JDBC Environment Setup, Establishing JDBC Database Connections, Result Set Interface **Java FX GUI:** Java FX Scene Builder, Java FX App Window Structure, displaying text and image, event handling, laying out nodes in scene graph, mouse events

Text Books:

1) JAVA one step ahead, Anitha Seth, B.L.Juneja, Oxford.
2) Joy with JAVA, Fundamentals of Object Oriented Programming, DebasisSamanta, MonalisaSarma, Cambridge, 2023.
3) JAVA 9 for Programmers, Paul Deitel, Harvey Deitel, 4th Edition, Pearson.

References Books:

1) The complete Reference Java, 11thedition, Herbert Schildt,TMH
2) Introduction to Java programming, 7th Edition, Y Daniel Liang, Pearson

e- Resources:

1) https://nptel.ac.in/courses/106/105/106105191/
2) https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_012880464547618816347_shared/overview

PRAGATI ENGINEERING COLLEGE

R23

(AUTONOMOUS)

Department of Civil Engineering

III Year II Semester

ENTREPRENEURSHIP AND VENTURE CREATION

III YEAR II SEMESTER (Common to CE, EEE, ME, ECE)

Course Category	Open Elective	**Credits**	3
Course Type	Theory	**L-T-P-C**	3 -0 -0-3
Prerequisites		**Internal Assessment** **Semester End Examination** **Total Marks**	30 70 100

Course Outcomes		**BTL**
Upon successful completion of the course, the student will be able to		
CO 1	Classify entrepreneurial and intrapreneurial concepts, attributes, and mindset to identify personal entrepreneurial potential using classroom discussions and case studies.	K2
CO 2	Apply design thinking principles to identify and validate problems and customer segments to achieve accurate problem–customer fit through field research and simulated venture activities.	K3
CO 3	Analyze solution designs and feasibility prototypes to determine their effectiveness in achieving proof-of-concept validation under iterative testing conditions.	K4
CO 4	Analyze business and revenue models along with financial plans to evaluate their potential for sustainability and profitability under simulated business planning scenarios.	K4
CO 5	Analyze investor pitch content to assess its effectiveness in communicating venture scale potential under simulated pitching conditions.	K4

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

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

PRAGATI ENGINEERING COLLEGE

(AUTONOMOUS)

Department of Civil Engineering

R23

COURSE CONTENT

Unit – I Entrepreneurship Fundamentals & Context: Meaning and concept, attributes and mindset of entrepreneurial and intrapreneurial leadership, role models in each and their role in economic development. An understanding of how to build entrepreneurial mindset, skillsets, attributes and networks while on campus.

Unit – II Problem & Customer Identification: Understanding and analysing the macro-Problem and Industry perspective, technological, socio economic and urbanization trends and their implication on new opportunities. Identifying passion, identifying and defining problem using Design thinking principles. Analysing problem and validating with the potential customer. Iterating problem-customer fit. Understanding customer segmentation, creating and validating customer personas. Competition and Industry trends mapping and assessing initial opportunity.

Unit – III Solution design, Prototyping & Opportunity Assessment and Sizing: Understanding Customer Jobs-to-be-done and crafting innovative solution design to map to customer's needs and create a strong value proposition. Developing Problem-solution fit in an iterative manner. Understanding prototyping and MVP. Developing a feasibility prototype with differentiating value, features and benefits. Initial testing for proof-of-concept and iterate on the prototype. Assess relative market position via competition analysis, sizing the market and assess scope and potential scale of the opportunity.

Unit – IV Business & Financial Model, Go-to-Market Plan: Introduction to Business model and types, Lean approach, 9 block lean canvas model, riskiest assumptions to Business models. Importance of Build - Measure – Lean approach. **Business planning:** components of Business plan- Sales plan, People plan and financial plan. **Financial Planning:** Types of costs, preparing a financial plan for profitability using financial template, understanding basics of Unit economics and analysing financial performance.
Introduction to Marketing and Sales, Selecting the Right Channel, creating digital presence, building customer acquisition strategy. Choosing a form of business organization specific to your venture, identifying sources of funds: Debt & Equity, Map the Start-up Lifecycle to Funding Options.

Unit – V Scale Outlook and Venture Pitch readiness: Understand and identify potential and aspiration for scale vis a vis your venture idea.
Persuasive Storytelling and its key components. Build an Investor ready pitch deck.

Textbooks:

1. Robert D. Hisrich, Michael P. Peters, Dean A. Shepherd, Sabyasachi Sinha (2020). Entrepreneurship, McGrawHill, 11th Edition.
2. Ries, E. (2011). The Lean Startup: How Today's Entrepreneurs Use Continuous Innovation to Create Radically Successful Businesses. Crown Business

Reference Books :

1. Osterwalder, A., & Pigneur, Y. (2010). Business Model Generation: A Handbook for Visionaries, Game Changers, and Challengers. John Wiley & Sons.
2. Simon Sinek (2011) Start with Why, Penguin Books limited
3. Brown Tim (2019) Change by Design Revised & Updated: How Design Thinking Transforms Organizations and Inspires Innovation, Harper Business
4. Namita Thapar (2022) The Dolphin and the Shark: Stories on Entrepreneurship, Penguin Books Limited
5. Saras D. Sarasvathy, (2008) Effectuation: Elements of Entrepreneurial Expertise, Elgar Publishing Ltd

Web References:

Learning resource- Ignite 5.0 Course Wadhwani platform (Includes 200+ components of custom created modular content + 500+ components of the most relevant curated content)

PRAGATI ENGINEERING COLLEGE

R23

(AUTONOMOUS)

Department of Civil Engineering

III Year – II Semester

Environmental Engineering Laboratory

Course Category	Professional Core lab	**Course Code**	
Course Type	Lab	**L-T-P-C**	0-1-2-2
Prerequisites	Environmental Engineering	**Continuous Internal assessment** **Semester End Examination** **Total Marks**	30 70 100

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

Course Outcomes:

Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Estimate some important characteristics of water and wastewater in the laboratory	**K3**
CO2	Draw some conclusion and decide whether the water is suitable for construction or not, drinking or not; ultimate disposal as per effluent standards or not.	**K2**
CO3	Decide whether the water body is polluted or not with reference to the state parameters in the list of experiments	**K4**
CO4	Estimate and study the strength of the raw and treated effluents in terms of BOD, COD, pH, TDS and chloride of the neutralization tank treating effluents from Chemistry lab or Environmental Engineering Laboratory	**K3**

K1: Remember, K2: Understand, K3: Apply, K4: Analyze, K5: Evaluate, K6: Create.

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

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

COURSE CONTENT

LIST OF EXPERIMENTS

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

Textbooks

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

Reference

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

PRAGATI ENGINEERING COLLEGE

R23

(AUTONOMOUS)

Department of Civil Engineering

III Year – II Semester

Highway Engineering Laboratory

Course Category	Professional Core lab	**Course Code**	
Course Type	Lab	**L-T-P-C**	0-1-2-2
Prerequisites	Highway Engineering	**Continuous Internal assessment** **Semester End Examination** **Total Marks**	30 70 100

Course Objectives:	
1.	To study the properties and judge the suitability to use as road materials.
2.	To study the properties and stability requirements of the Bitumen mixes.
3.	To carry out surveys for traffic volume, speed and parking

Course Outcomes:

Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Perform laboratory tests on road aggregates (crushing, impact, shape, abrasion, attrition, specific gravity & water absorption) and interpret their significance for pavement materials.	**K3**
CO2	Conduct standard bituminous material tests (penetration, ductility, softening point, flash & fire point, viscosity, stripping) and assess binder suitability.	**K2**
CO3	Determine Marshall stability and flow for bituminous mixes and evaluate mix suitability for pavements	**K4**
CO4	Plan and carry out traffic surveys (mid-block volume, turning movement counts, spot speed studies) and analyze traffic data for engineering decisions.	**K3**

K1: Remember, K2: Understand, K3: Apply, K4: Analyze, K5: Evaluate, K6: Create.

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

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

PRAGATI ENGINEERING COLLEGE

(AUTONOMOUS)

Department of Civil Engineering

R23

COURSE CONTENT

LIST OF EXPERIMENTS

1. ROADAGGREGATES :

a) To determine the Aggregate Crushing value. (IS:2386 Part-IV 1963)
b) To determine the Aggregate Impact value. (IS:2386 Part-IV 1963)
c) To determine the specific Gravity and Water Absorption test for aggregates. (IS:2386 Part- III 1963)
d) To conduct the Attrition Test for aggregates. (IS:2386 Part-V 1963)
e) To conduct the Abrasion Test for aggregates. (IS:2386 Part-V 1963)
f) To conduct the Shape tests for aggregates. (IS:2386 Part-I 1963)

2. BITUMINOUSMATERIALS :

a) To determine the Penetration value. (IS:1203-1978)
a) To conduct Ductility Test. (IS:1208-1978)
b) To determine the Softening Point. (IS:1205-1978)
c) To determine the Flash and fire point. (IS:1209-1978)
d) To conduct Stripping Test. (IS:6241-1971)
e) To determine the Viscosity. (IS:1206-1978)

3. BITUMINOUS MIX:

a) To determine the Marshall Stability Number.

4. **TRAFFIC SURVEYS**:

a) To conduct Traffic volume study at mid-blocks.
b) To conduct Traffic Volume Studies (Turning Movements) at intersection.
c) To conduct Spot speed studies.

5. **DESIGN & DRAWING**:

a) Earthwork calculations for road works.
b) Drawing of road cross sections

TEXTBOOKS:

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

REFERENCE BOOKS:

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

PRAGATI ENGINEERING COLLEGE: SURAMPALEM
(Autonomous)
Department of Civil Engineering

R23

III Year – II Semester
CAD Lab

Course Category	Skill Enhancement course	**Course Code**	
Course Type	Lab	**L-T-P-C**	0-1-2-2
Prerequisites	Engineering Graphics Building Planning & Drawing	**Continuous Internal assessment** **Semester End Examination** **Total Marks**	30 70 100

Course Objectives:	
1.	Learn the usage of any fundamental software for design
2.	Apply geometries using pre-processor
3.	Design the structural elements

Course Outcomes:

Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Understand the geometry of real-world structure Represent the physical model of structural element/structure	**K2**
CO2	Interpret from the Post processing results	**K3**
CO3	Perform Designs of different structural elements	**K3**

K1: Remember, K2: Understand, K3: Apply, K4: Analyze, K5: Evaluate, K6: Create.

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

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

-

COURSE CONTENT

LIST OF EXPERIMENTS

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

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

Textbook:

1. **M.A. Parameswaran** *"Computer Aided Design Laboratory"* **Publisher:** Laxmi Publications
   - Covers AutoCAD basics, 2D/3D drafting, and structural applications.
   - Suitable for introductory-level CAD lab courses in civil engineering.

PRAGATI ENGINEERING COLLEGE: SURAMPALEM
(Autonomous)
Department of Civil Engineering

R23

III Year II Semester
Salesforce Developer Catalyst
(Common to All Branches)

Course Category	Skill Enhancement Course	**Course Code**	
Course Type	Laboratory	**L-T-P-C**	0-1-2-2
Prerequisites		**Continuous Internal Assessment** **Semester End Examination** **Total Marks**	30 70 100

COURSE OBJECTIVES	
1	To be intended for an individual who has experience developing and deploying basic business logic and user interfaces.
2	Train the individuals to the next level, who have the knowledge, skills, and experience in building custom applications on the Lightning Platform.
3	To learn the fundamental programmatic capabilities of the Lightning Platform to develop custom business logic and interfaces to extend Salesforce using Apex, Visualforce, and basic Lightning Components.
4	To use the programmatic capabilities in practice with the Lightning Platform, including practical application of the skills and concepts.

COURSE OUTCOMES		
Up on successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Acquire a fundamental understanding of the CRM and Salesforce tools necessary to effectively generate useful applications on the Salesforce platform to support the customer requirements.	K3
CO2	Gain experience in using the Salesforce tools and techniques of CRM to complete projects focused on obtaining actionable insights from complex data.	K3
CO3	Dive deeply into a Salesforce Developer practice to fully prepare to use knowledge gained in the course to add significant value in a professional setting.	K3

K1-Remembering,K2-Understanding,K3-Applying,K4-Analyzing,K5-Evaluating,K6-Creating

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	2	2	1	0	2	0	0	0	0	0	1
CO2	2	2	1	0	1	0	0	0	0	0	1
CO3	2	2	1	0	1	0	0	0	0	0	1

COURSE CONTENT :

Experiment 1

Platform Developer I Exam Overview; Apex & .NET Basics: Map .NET Concepts to the Lightning Platform, Understand Execution Context, Use Asynchronous Apex, Debug and Run Diagnostics. Formulas and Validations: Use Formula Fields, Implement Roll-Up Summary Fields, Create Validation Rules.
Data Modeling: Understand Custom & Standard Objects, Create Object Relationships, Work with Schema Builder.
Data Management: Import Data, Export Data. (Sessions- 04)

Experiment-2

Approve Records with Approval Processes: Customize How Records Get Approved, Build an Approval Process.
Record-Triggered Flows: Triggered Flows, Build a Record-Triggered Flow, Add a Scheduled Task to Your Flow, Meet Flow Trigger Explorer.
Search Solution Basics: Choose the Right Search Solution, Build Search for Common Use Cases, Optimize Search Results.
Apex Basics & Database: Get Started with Apex, Uses Objects, Manipulate Records with DML, Write SOQL Queries, Write SOSL Queries.
Apex Triggers: Get Started with Apex Triggers, Bulk Apex Triggers. (Sessions-07)

Experiment 3 :
Triggers and Order of Execution: Performing a sequence of events in an order when a record is saved with an insert, update, or upsert statement.
Asynchronous Apex: Asynchronous Processing Basics, Use Future Methods, Use Batch Apex, Control Processes with Queueable Apex, Schedule Jobs Using the Apex Scheduler, Monitor Asynchronous Apex. (Sessions-06)
Experiment 4:
Visual force & Lightning Experience: Use Visualforce in Lightning Experience, Develop Visual force Pages for Lightning Experience, Explore the Visualforce App Container, Share Visual force Pages Between Classic and Lightning Experience, Manage Navigation, Understand Important Visual Design Considerations, Know Which Features to Avoid in Lightning Experience.
Visual force Basics: Get Started with Visual force, Create & Edit Visual force Pages, Use
Simple Variables and Formulas, Use Standard Controllers, Display Records, Fields, and Tables, Input Data Using Forms, Use Standard List Controllers, Use Static Resources, Create & Use Custom Controllers. (Sessions-06)
Experiment 5:
Lightning Web Components Basics: Discover Lightning Web Components, Create Lightning Web Components, Deploy Lightning Web Component Files, Handle Events in Lightning Web Components, Add Styles and Data to a Lightning Web Component.
Secure Server-Side Development: Write Secure Apex Controllers, Mitigate SOQL Injection, Mitigate Cross-Site Request Forgery. (Sessions-04)
Experiment 6:
Developer Console Basics: Get Started with the Developer Console, Navigate and Edit
Source Code, Generate and Analyze Logs, Inspect Objects at Checkpoints, Execute SOQL and SOSL Queries.
Command-Line Interface: Learn About the Command-Line Interface, Explore Command Structure and Navigation, Set Up Command-Line Tools.
Org Development Model: Plan for Changes to Your Org, Develop and Test Changes Locally, Test and Deploy Changes. (Sessions-04)
Experiment 7:
Apex Testing: Get Started with Apex Unit Tests, Test Apex Triggers, Create Test Data for Apex Tests.
Find and Fix Bugs with Apex Replay Debugger: Launch Your Trailhead Playground, Set
Up Visual Studio Code, Set Up Apex Replay Debugger, Debug Your Code.
Debug Logs: Debug Log Details, Debug Log Order of Precedence, Debug Log Levels,
Searching a Debug Log, Delete Debug Logs, Debug Log Filtering for Apex. (Sessions-05)
Experiment 8:
Project with Case Study:
Apex Specialist: Concepts Tested in This Superbadge, Apex Triggers, Asynchronous Apex, Apex Integration, Apex Testing. (Sessions-12)

TEXTBOOKS:
1. Michael Wicherski, “Beginning Salesforce Developer”, 2018, Wiley Apress Publisher.
2. Paul Battisson, “Learning Salesforce Development with Apex”, 2020, BPB Publishers.
3. Dan Appleman, “Advanced Apex Programming in Salesforce”, 2018, PACKT Publisher.
4. Paul Battisson, “Mastering Apex Programming”, 2020, PACKT Publisher.

REFERENCE BOOKS:
1. Mohith Shrivastava, “Learning Salesforce Lightning Application Development: Build and test
Lightning Components for Salesforce Lightning Experience using Salesforce DX”, 2018, PACKT.
2. Brian Cline, “Lightning Web Components (LWC) Development on the Salesforce Platform: A
Salesforce developer's guide to building, testing, and deploying Lightning Web Components”, 2023, PACKT Publisher.
3. Saifullah Saifi and Ashwini Kumar Raj, “Cloud Computing Using Salesforce”, 2021 BPB.

e-Resources :
1. Use the Trailhead Platform: https://www.salesforce.com/blog/what-is-trailhead/
The Salesforce Developer Trailmix:
2. https://trailhead.salesforce.com/users/trjha3/trailmixes/salesforce-developer-catalyst-v-3-0

PRAGATI ENGINEERING COLLEGE: SURAMPALEM
(Autonomous)
Department of Civil Engineering

R23

III Year II Semester
Technical Paper Writing & IPR
(Common to CSE, IT, CSE (AIML), CSE (AI), CSE (DS),CSE (CS), ECE,ME & CE)

Course Category	Audit Course	**Course Code**	
Course Type	Theory	**L-T-P-C**	2-0-0-
Prerequisites		**Continuous Internal Assessment** **Semester End Examination** **Total Marks**	30 70 100

COURSEOBJECTIVES	
1	To develop the ability to write and present technical research papers.
2	To impart knowledge on IPR and its importance in innovation and research.
3	To guide students in understanding patents, copyrights, trademarks, and their application in computing and engineering.

COURSE OUTCOMES		
Up on successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Identify and apply the structure and principles of technical writing to prepare clear and well-organized technical documents.	K2
CO2	**Conduct a literature survey** using academic databases and reference management tools to support research and identify gaps in existing knowledge.	K2
CO3	Draft and format technical papers suitable for submission to conferences and journals, adhering to ethical and publication standards.	K3
CO4	**Explain the fundamental concepts of Intellectual Property Rights (IPR)** including patents, copyrights, trademarks, and trade secrets, especially in the context of computing and innovation.	K2
CO5	**Analyze patentability criteria** and outline the procedure for filing a patent in India and internationally.	K4

K1-Remembering, K2-Understanding,K3-Applying,K4-Analyzing,K5-Evaluating,K6-Creating

CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**
CO1	1	3	1	0	1	3	1	1	1	1	1
CO2	1	2	3	0	1	2	1	1	1	1	1
CO3	1	3	1	0	1	3	1	1	1	1	1
CO4	3	2	1	0	3	1	1	1	2	2	2
CO5	1	2	2	0	3	1	1	1	2	2	2

CURSE CONTENT

UNIT 1:

Introduction to Technical Writing

Meaning and importance of technical writing in research and development Types of technical documents: journal papers, conference papers, white papers, reportsStructure of a technical paper (IMRAD format) Characteristics of effective writing: clarity, conciseness, coherence Common mistakes in technical writing Tools for writing and formatting (LaTeX, MS Word)

Practical: Write a 300-word abstract on a chosen technical topic

UNIT 2:

Research Methodology and Literature Survey

Research problem identification and formulation Research process and ethics Literature review: importance, sources (journals, patents, databases) Referencing styles (APA, IEEE, MLA) Use of digital tools (Google Scholar, Scopus, Mendeley, Zotero) Plagiarism: types, detection tools (Turnitin, Grammarly)

Practical: ***Conduct a literature survey and create a reference list for a chosen topic***

UNIT 3:

Manuscript Preparation and Publication

Components of a manuscript: abstract, keywords, introduction, methodology, results, discussion, conclusion, references Guidelines for authors (IEEE, Springer, Elsevier, ACM) Peer review process and revisions Journal selection and impact factor Ethics in publishing and copyright issues Predatory journals and conferences

*Practical****: Draft a technical paper on a mini-project done in earlier semesters***

UNIT 4:

Introduction to Intellectual Property Rights (IPR)

Definition and need for IPR Categories of IPR: patents, copyrights, trademarks, trade secrets Indian and international IPR laws (WIPO, TRIPS) Role of IPR in academic and industrial R&D Case studies of IPR in computer science and software

Practical*: Identify the IPR involved in a case study (e.g., a software product or invention)*

UNIT 5:

Patent Filing and Commercialization :

Patentability criteria: novelty, inventive step, industrial application Patent filing procedure in India and USA Provisional vs complete specification Patent databases: Espacenet, INPADOC, IP India Patent search and analysis Commercialization of IP: licensing, technology transfer, startups

Practical: *Draft a simple provisional patent specification based on a student project*

Textbooks *:*

1.M.A. Jayaram, Technical Communication, *Himalaya Publishing House*

2.Deborah B. Stanley, Practical Guide to Writing Technical Reports, *OUP*

3.R. Subbaram, Handbook of Indian Patent Law and Practice

Reference Books

*1.****P. Narayanan***, Intellectual Property Law

2.WIPO & Indian Patent Office websites for updates and resources