Department of Civil Engineering

(Detailed Autonomous Syllabus)

Course Name: Advanced Engineering Mathematics
Course Code: BSC-M 301 (CE)
(Semester III)
Course Broad Category: B. Tech CE

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1. **Course Prerequisite:**

Knowledge in functions of several variables and ODE, Set Theory.

2. **Course Learning Objectives:**

The objective of these courses to familiarize the prospective engineers with techniques in apply the concept of partial differential equations like heat and wave equations. It aims to equip the students with the concepts and tools of probability and statistics. It will also aim to enhance the knowledge and techniques to solve problems numerically.

3. **Teaching methodology and evaluation system for the course:**

Teaching methodology – Lectures and Presentations, Interactive Discussions and Case Studies, Guest Lectures.

Evaluation System –

A. Mid-Term Exam (20 Marks)- Summative Assessment (CIA-1)
B. Internal Assessment (20 Marks)- Formative Continuous Assessment [Continuous Assessment 1 (CIA-2)]
C. End-Semester Exam (60 Marks)- Summative Assessment.

4. **Course Content:**

Course Name: Advanced Engineering Mathematics
Course Code: BSC-M 301 (CE)
Hours per Week: 3L:1T:0P
Credits: 3

Module	Topics	36L
1.	**Partial Differential Equations:** Formation and Solution of Partial Differential equations, solutions of First order Linear PDEs, Second order linear equations and their classification, Solution to Homogeneous and Non-Homogeneous Linear PDEs of second order by complimentary function and particular integral method.	8L
2.	**Application Of Partial Differential Equations:** D'Alembert's solution of the wave equation, Duhamel's principle for one dimensional wave equation, Heat diffusion and vibration problems, Separation of variable method.	8L

3.	**Basic concept in Probability and Statistics:** Probability: Definition of various probability axioms, Independent events, Conditional event, Baye's Theorem, Random variable and Expectation, Moment Generating Function, Probability mass function (Binomial Distribution, Poisson's Distribution) and Probability density function (Normal Distribution), Poisson approximation to Binomial (application). Statistics: Measure of central tendency, Correlation- Regression, confidence interval and testing of hypothesis.	12L
4.	**Numerical methods:** Interpolation by polynomial:forward,backward,Lagrange, divided difference. Concept of simple Difference equations. Solution of nonlinearequations: fixed point iteration, newton and secant methods. Convergence condition. Numerical Integration – trapezoidal and Simpson's one third Rule, solution of ODE – Euler's and RK method, Systems of ODE.	8L

5. References:

Text Book:

- B. S. Grewal-- Higher Engineering Mathematics; Publisher**.** Khanna **Publishers.**
- Ramana B. V. --- Higher Engineering Mathematics; **Publisher.** McGraw Hill Education**.**

Reference Books:

- E. Kreyszig--- Advanced Engineering Mathematics (9^{th} Edition)
- Bali &Goel--- Text Book of Engineering Mathematics.
- H. K. Das---Higher Engineering Mathematics
- Zafar Ahsan --- Differential Equations and Their Applications
- R. K. Jain and I. C. Gupta ---Partial Differential Equations
- M. G. Nadkarni ----Partial Differential Equations: A Unified Approach
- Stanley J. Farlow ----Partial Differential Equations for Scientists and Engineers
- Sheldon Ross---A First Course on probability
- R N Hazra&MoloySarakar ---Fundamental of Probability and Statistics
- Veerarajan T.--- Probability and Statistics
- Dr. S. A. Mollah ----Introduction to Numerical Analysis
- Rajaraman, V ---Numerical Methods.
- S. S. Sastry---Introductory Methods of Numerical Analysis
- Jain & Jain---Numerical Analysis for Scientists and Engineers

6. Course Outcomes (CO):

Course Outcomes	Details/Statement	Action Verb	Knowledge Level
BSC-M 301.1	Learn to apply different tools in Partial Differential Equations and Probability which would enable them to devise solutions to encounter engineering problems in their profession life.	Identify	Learn
BSC-M 301.2	Understand the concept of uses and applications of Probability and Statistics in applied sciences and engineering problems.	Explain	Understand
BSC-M 301.3	Apply the concept of Interpolation, Numerical Integration and Solution of nonlinear equations to find solutions in real life problems.	Implement	Apply
BSC-M 301.4	Analyze the ideas of mentioned mathematical tools to solve complex real-life problems.	Organize	Analyze
BSC-M 301.5	Evaluating the gradation of described Statistical and Numerical tools and determines the right approach to solve multidisciplinary engineering problems.	Assess	Evaluate
BSC-M 301.6	Build up logical and analytical skills to create a new idea appreciated by academics, research & emerging trends in industry.	Construct	Create

7. Mapping of course outcomes to module / course content

Module	CO1	CO2	CO3	CO4	CO5	CO6
1	3	-	-	2	-	1
2	2	3	-	1	-	1
3	2	3	3	2	-	1
4	3	-	-	2	-	1
5	2	-	-	1	3	1

8. Mapping of the Course outcomes to Program Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	2	2	1	1	2	-	-	-	-	-	1
CO2	1	2	3	1	-	-	-	-	-	-	1

CO3	1	2	2	1	1	-	-	-	-	-	1
CO4	1	2	1	1	2	-	-	-	-	-	2
CO5	2	2	2	2	2	-	-	-	-	-	1
CO6	1	1	1	1	-	-	-	-	-	-	1

9. Mapping to Program Specific Outcome (PSO)

	PSO1	**PSO2**	**PSO3**
CO1	3	3	1
CO2	3	2	1
CO3	3	2	1
CO4	3	3	1
CO5	3	3	1
CO6	1	1	1

Course Name: SOLID MECHANICS
Course Code: CE-302
(Semester III)
Category: Major
Course Broad Category: ENG SCIENCE (ES)

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5. Course Prerequisite:
   Engineering Mechanics, Basic Calculus.

6. Course Learning Objectives:
   i. Students will learn to analyze stress, strain, and mechanical behavior of materials, including beams, trusses, and columns under various forces.
   ii. They will apply solid mechanics principles to solve practical engineering problems related to torsion, bending, and buckling.

7. Teaching methodology and evaluation system for the course:
   Teaching methodology –Lectures and Presentations, Interactive Discussions and Case Studies.
   Evaluation System –
   CIA1: 40 MARKS (25 marks written class test, 15 marks Attendance/assignment)
   CIA2: 40 MARKS (25 marks written class test, 15 marks Attendance/assignment)
   Final exam: 60 marks

8. Course Content:
   Course Name: Solid Mechanics
   Course Code: CE-302
   Hours per Week:2L:1T:0P
   Credits: 3

Module	Topics	42L	Syllabus Coverage (%)
5.	Simple Stress and Strain: Definition of stress and strain; Types of stress and strain; Hooke's law; Stress-Strain diagram of ductile and brittle materials; Elastic limit; Ultimate stress; Yielding; Modulus of elasticity; Lateral strain, Poisson's ratio, Volumetric strain, Elastic modulus and its variation; Factor of safety.	3L+2T	12
6.	Shear Force Diagram and Bending Moment for Determinate Beams: Support reactions; Concepts of redundancy; Axial force; Shear force and bending moment diagrams for simply supported beams, cantilever and overhanging beams with concentrated, uniformly distributed, linearly varying load, concentrated moments; Point of contraflexure.	4L+2T	14
7.	Beam Bending: Theory of simple bending; Basic kinematic assumption; moment of inertia; elastic flexure formulae and its application; Bending and shear stress for regular sections; Bending of unsymmetrical sections; Section modulus; shear centre.	4L+1T	12
8.	Deflection of Statically Determinate Beams: Slope, deflection and radius of curvature; Differential equation for the elastic line of a beam; Double integration and Macaulay's methods; Determination of slope and deflection for cantilever and simply supported beams subjected to point loads, U.D.L, Uniformly varying load and couple; Mohr's theorems; Moment area method; Conjugate beam method; Application to simple cases.	4L+2T	14
9.	Analysis of Determinate Plane Trusses: Concepts of redundancy; Analysis by method of joints, Method of sections.	2L+1T	7
10.	Two Dimensional Stress Problems: Principal stresses; Maximum shear stresses; Mohr's stress circle.	2L+1T	7
11.	Introduction to Cylindrical & Spherical Shells: Thin cylinders; Thick cylinders and sphere; Hoop stress and meridional-stress; Volumetric strain.	2L+1T	7
12.	Torsion of Circular and Non-Circular Sections: Pure torsion; Derivation of torsion equation and its assumptions; Torsion of circular solid shaft and hollow shafts; Torsional rigidity; Torsion of non-circular sections.	3L+1T	10
13.	Spring: Types of springs; Helical springs under axial load and under axial twist.	2L+1T	7
14.	Columns: Fundamentals; Criteria for stability in equilibrium; Column buckling theory; Euler's load for columns with different end conditions; Limitations of Euler's theory – problems; Eccentric load and secant formulae.	3L+1T	10

15. References:

Text Book:

- Strength of Materials, S. S.Bhavikatti,Vikas Publishing House Ltd.
- Strength of Materials, S. Ramamrutham, Dhanpat Rai & Sons.
- Strength of Materials, R. Subramanian, OXFORD University Press.

Reference Books:

- Elements of Strength of Material, S. P. Timoshenko andD. H. Young, EWP Pvt. Ltd.
- Fundamentals of Strength of Material, Nag & Chandra, WIE.

16. Course Outcomes:

Course Outcomes	Details/Statement	Action Verb	Knowledge Level
CO1	Explain the concepts of stress, strain, and Hooke's law, and use stress-strain diagrams to interpret the mechanical behavior of ductile and brittle materials, including factors such as elastic limit, ultimate stress, and Poisson's ratio.	Explain, Use	Apply
CO2	Design shear force and bending moment diagrams for various beam configurations, and use the theory of bending and deflection to solve problems involving beam bending stresses, deflection and moments, including the application of elastic flexure formulae and point of contraflexure.	Design, Use	Create
CO3	Implement the concept of Mohr's circle to find principal stresses and maximum shear stresses in two-dimensional stress systems.	Implement	Apply
CO4	Examineinternal forces in determinate plane trusses with the help of method of joints and method of sections, considering concepts of redundancy.	Examine	Analyse
CO5	Investigate the stress distributions in thin and thick cylindrical and spherical shells under internal pressure, and solve torsion equations to analyze circular and non-circular shafts, as well as helical springs under axial load and twist.	Investigate, Solve	Create
CO6	Examine column buckling theory and Euler's load equations for stability problems in columns with various end conditions, considering the limitations of Euler's theory and eccentric loading scenarios.	Examine	Analyse

17. Mapping of course outcomes to module / course content

Module	CO1	CO2	CO3	CO4	CO5	CO6
1	3	-	-	-	-	-
2	-	3	-	-	-	-
3	-	3	-	-	-	-
4	-	2	-	-	-	-
5	-	-	-	3	-	-
6	-	-	3	-	-	-
7	-	-	-	-	3	-
8	-	-	-	-	2	-
9	-	-	-	-	2	-
10	-	-	-	-	-	3

18. Mapping of the Course outcomes to Program Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	2	1	2	-	1	-	-	-	-	-
CO2	3	3	3	1	-	-	-	-	-	-	-
CO3	3	3	-	2	2	-	-	-	-	-	-
CO4	3	3	-	3	-	-	-	-	-	-	-
CO5	3	3	2	3	-	2	-	-	-	-	-
CO6	3	3	-	2	-	1	-	-	-	-	-

19. Mapping to PSO

	PSO1	PSO2	PSO3
CO1	3	-	-
CO2	3	-	-
CO3	3	-	-
CO4	3	-	-
CO5	3	-	-
CO6	3	-	-

Course Name: CONCRETE TECHNOLOGY
Course Code: CE-303
(Semester III)
Category: MAJOR
Course Broad Category: CORE ENGG (Professional Core Courses)

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1. Course Prerequisite:
   Basic civil engineering material knowledge.
2. Course Learning Objectives:
   i. The course focuses on concrete making materials including supplementary cementitious materials. Concrete production process also forms a part of the discussion.
   ii. Going through the course students would develop first-hand knowledge on concrete production process and properties and uses of concrete as a modern material of construction. The courses will enable one to make appropriate decision regarding ingredient selection and use of concrete.

3. Teaching methodology and evaluation system for the course:
   Teaching methodology –Lectures and Presentations, Interactive Discussions and Case Studies, and Field Visits.
   Evaluation System –

   Total Marks: 100 [40(CIA) + 60% of (ESE)]
   - CIA1: 40 MARKS (25 marks written class test, 15 marks Attendance/assignment)
   - CIA2: 40 MARKS (25 marks written class test, 15 marks Attendance/assignment)
   - Final exam: 60 marks ESE (Written Examination) Final comprehensive exam of 3hrs, covering the entire syllabus. The paper includes 5 compulsory questions (20 marks each).Each question must contain sub-parts derived from different Course Outcomes (COs).

4. Course Content:
   Course Name: CONCRETE TECHNOLOGY
   Course Code: CE-303
   Hours per Week: 3L:0T:0P
   Credits: 3

Module	Topics	42L
1.	Cement: Manufacturing of cement, oxides composition of cement and the calculation of compounds, types of cement, and different grades of cement. chemical composition, hydration and structure of hydrate cement, setting of cement, test on cement, special cements, cement plant.	5L
2.	Aggregates: Classification of aggregate, types of aggregates, deleterious substances in aggregates, particle shape & texture, strength, alkali aggregate reaction& other mechanical properties of aggregate. Test on aggregates, sieve analysis, fineness modulus, grading curves, grading of fine & coarse aggregates, specific gravity, bulk density, porosity, adsorption & moisture content of aggregate, bulking of sand, soundness of aggregate, thermal properties, flakiness & elongation index.	5L
3.	Admixtures: Types, uses, water reducers, air entrainers, set controllers, specialty admixtures, structure properties, and effects on concrete properties. Case study. Introduction to supplementary cementing materials and pozzolans (fly ash, blast furnace slag, silica fume, and metakaolin – their production, properties, and effects on concrete properties). Reactive and inert mineral additives in concrete.	4L
4.	Fresh Concrete: Workability, Factors affecting workability, measurement of workability by different tests: slump test, compacting factor test, vee-bee test, flow table test., setting times of concrete, effect of time and temperature on workability, segregation & bleeding, mixing and vibration of concrete, steps in manufacture of concrete, quality of mixing water, sea water for mixing concrete. Curing of concrete.	5L
5.	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 compressive & tensile strength. flexural strength, stress-strain characteristics, modulus of elasticity, poisson's ratio, Creep, Shrinkage, permeability of concrete, micro cracking of concrete.	5L
6.	Testing of Hardened Concrete: Compression tests, tension tests, flexure tests, splitting tests, pull-out test, non-destructive testing methods, codal provisions for NDT. Elasticity, Creep & Shrinkage – Modulus of elasticity – Dynamic modulus of elasticity – Poisson's ratio – Creep of concrete.	5L
7.	Mix Design: Objectives of Mix Design, Factors in the choice of mix proportions, Methods of Mix Design, Mix design by I.S. 10262-2019. (With & without admixture).	4L
8.	Durability and quality control of concrete, Chemical attack of concrete corrosion of steel rebar, other durability issues Sampling and testing, acceptance criteria.	4L
9.	Special Concrete: Introduction to lightweight concrete, cellular concrete, no-fines concrete, high density concrete, fibre reinforced concrete, polymer concrete, high performance concrete, self-compacting concrete, ready mix concrete, batching plant, ferrocement, mass concrete.	5L

6. References:

Text Book:

- Concrete Technology by M. S. Shetty. – S. Chand & Co. 2004
- Concrete Technology by M.L. Gambhir. – Tata Mc. Graw Hill Publishers, New Delhi
- Properties of Concrete by A. M. Neville Pearson 5th edition Education ltd 2016.
- Concrete: Microstructure, Properties and Materials – P. K. Mehta and J. M.

Monteiro, McGraw Hill Publishers.

- AR Santa kumar, Concrete Technology, Oxford University Press

Reference Books:

- Concrete Technology by Job Thomas -Cengage learning India Pvt Ltd 2015.
- IS 456 (2000), Plain and Reinforced Concrete - Code of Practice, Bureau of Indian Standards (BIS), New Delhi, India.
- IS 10262 (2019), Concrete Mix Proportioning – Guidelines, Bureau of Indian Standards (BIS), New Delhi, India.

7. Course Outcomes:

Course Outcomes	Details/Statement	Action Verb	Knowledge Level
CO1	Explain the composition, manufacturing process, chemical compounds and types of cement, along with influence of aggregate and water in concrete making.	Explain	Understand
CO2	Identify appropriate aggregate types and conduct tests to evaluate their suitability for concrete construction.	Identify	Understand
CO3	Recognize the role of admixtures in concrete and understand the effectiveness of material additives in concrete.	Recognize	Understand
CO4	Relate the factors affecting fresh and hardened concrete properties and perform tests to measure workability and strength.	Relate	Analyze
CO5	Design concrete mixes using the IS 10262-2019 method.	Design	Create
CO6	Evaluate the durability parameters of concrete and relate the applicability of special concrete in the industry.	Evaluate	Understand

8. Mapping of course outcomes to module / course content

Module	CO1	CO2	CO3	CO4	CO5	CO6
1	3	-	-	-	-	-
2	-	3	-	-	-	-
3	-	-	3		-	-
4	-	-		3	-	-
5	-	-	-	3	-	-
6	-	-	-	-	-	-
7	-	-	-	-	3	-
8	-	-	-	-	-	3
9	-	-	-	-	-	3

9. Mapping of the Course outcomes to Program Outcomes

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

CO5	3	3	3	2	2	1	-	-	-	-	1
CO6	2	1	1	1	-	1	-	-	-	-	1

10. Mapping to PSO

	PSO1	PSO2	PSO3
CO1	3	1	1
CO2	3	1	1
CO3	3	2	2
CO4	3	2	1
CO5	3	2	2
CO6	3	1	2

Course Name: SUSTAINABLE AND GREEN CONSTRUCTION

Course Code: CE-304

(Semester III)

Category: Minor

Course Broad Category: CORE ENGG (Professional Core Courses)

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1. Course Prerequisite:
   Class-XII level knowledge of Physics, Mathematics, and Environmental Science; Undergraduate level introductory knowledge of Civil Engineering.
2. Course Learning Objectives:
   i. This course introduces the concepts of sustainability in civil engineering and explores the role of construction materials in developing green infrastructure.
   ii. Students will also learn to design energy-efficient buildings, implement sustainable site planning, navigate green building certifications, and evaluate the economics and ethics of sustainable construction practices.
3. Teaching methodology and evaluation system for the course:
   Teaching methodology – Hands-on Laboratory Sessions, Pre-lab Theoretical Lectures and Discussions, Problem-solving Sessions, and Lab Reports and Data Interpretation.
   Evaluation System –
   Total Marks: 100 [60(PCIA) + 40(PESE)]
   Passing criteria: 50% and above
   PCIA (60 marks): Continuous Assessment, Attendance, Viva.
   Practical End Semester Examination (40 Marks): Written test.
4. Course Content:
   Course Name: Sustainable and Green Construction
   Course Code: CE-304
   Hours per Week: 3L:0T:0P
   Credits: 3

Module	Topics	42L	100 %
1.	Introduction to Sustainable Development and Environmental Science: Definition and concepts of sustainable development. Historical background and development of sustainability. Global and local sustainability challenges, Landscape and bio-diversity, Climate Change and Its Consequences, Environmental Pollution.	5L	12
2.	Sustainable Construction Materials and Technologies: Green building materials and technologies, life cycle assessment of materials, resource utilization and waste reduction in construction.	5L	12
3.	Energy Efficiency in Buildings and Water Management: Principles of Energy-Efficient Design, Integration of Renewable Energy in Building	10L	24

Module	Topics	42L	100 %
	Design, Energy-Efficient HVAC Systems, Overview of SCADA and Remote Sensing, Smart Green Buildings, Intelligent Inter-active and Economical Lighting Systems, Intelligent Addressable Fire Detection and Alarm System, Energy Saving Devices and Harnessing Solar Energy, Sustainable Water utilization in Construction Processes, Rainwater Harvesting and Greywater Recycling, Automatic Controls in Water Supply and Transportation Management.		
4.	Sustainable Building Design and Site Planning: Principles of green building design, Application of sustainable technologies in design, Site selection and evaluation for sustainable construction, green space planning, and landscaping.	6L	14
5.	Construction and Demolition Waste Management: Overview of Waste Reduction Practices, Recycling in Construction, Responsible Demolition Techniques, Recycling of Road Materials in Highway Development, Introduction to Circular Economy in Construction, Sustainable Project Planning and Implementation, Stakeholder Engagement and Communication, Monitoring and Assessment of Sustainability Performance.	8L	19
6.	Building Certifications, Environmental Regulations, and Ethics in Construction:LEED, GRIHA, BREEAM, and Other Certifications, Building Codes and Regulations for Sustainable Construction, Government Policies Promoting Green Construction, Cost-Benefit Analysis for Green Building Projects, Ethical Considerations and Social Impacts of Green Construction Projects.	8L	19

7. References:

Text Book:

- Introduction to Green Buildings & Built Environment, Indian Green Building Council, BS Publications, 2022.
- Automation Systems in Smart & Green Buildings, Er. A. K. Jain, Khanna Publishers, 2009.
- The Idea of Green Building, Er. A. K. Jain, Khanna Publishers, 2014.

Reference Books:

- Sustainable Construction Practices, Er. Chirag K Baxil, Dr. Snehal Abhyankar, Nexus Stories Publication, 2023.
- Sustainable Construction Management and Building Design Technologies, Mahmood Md. Tahir, Ali Keyvanfar, Arezou Shafaghat, LAP Lambert Academic Publishing, 2015.

8. Course Outcomes:

Course Outcomes	Details/Statement	Action Verb	Knowledge Level
CO1	Explain key concepts of sustainable development, including historical context and global/local challenges.	Explain	Understand
CO2	Identify and select sustainable construction materials and technologies based on life cycle assessment principles.	Identify, Select	Understand
CO3	Implement energy-efficient design principles and integrate renewable energy systems in building projects.	Implement	Apply
CO4	Design sustainable buildings by incorporating energy conservation, green technologies, and	Design	Create

	effective site planning.		
CO5	Identify and implement construction and demolition waste management strategies, focusing on recycling and circular economy principles.	Identify, Implement	Apply
CO6	Recognize environmental regulations and building certifications, and demonstrate the ethical implications of sustainable construction practices.	Recognize	Understand

9. Mapping of course outcomes to module / course content

Module	CO1	CO2	CO3	CO4	CO5	CO6
1	3	-	-	-	-	-
2	-	3	-	-	-	-
3	-	-	3	2	-	-
4	-	-	2	3	-	-
5	-	-	-	-	3	-
6	-	-	-	-	-	3

10. Mapping of the Course outcomes to Program Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	1	2	-	-	-	-	2	-	-	-	-
CO2	1	2	3		2	-	2	-	-	-	1
CO3	1	2	3	2	2	-	2	-	-	-	1
CO4	1	2	3	3	2	-	2	-	-	-	2
CO5	1	2	2	2	-	-	2	-	-	-	-
CO6	1	-	-	-	-	-	2	3	-	-	-

11. Mapping to PSO

	PSO1	PSO2	PSO3
CO1	3	2	1
CO2	3	3	2
CO3	3	2	2
CO4	3	2	3
CO5	2	2	2
CO6	3	1	2

Course Name: UNIVERSAL HUMAN VALUES
Course Code: CE-305
(Semester III)
Category: Minor
Course Broad Category: CORE ENGG (Professional Core Courses)

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1. Course Prerequisite: None
2. Course Learning Objectives:
   iii. To help the students appreciate the essential complementarily between 'VALUES' and 'SKILLS' to ensure sustained happiness and prosperity, which are the core aspirations of all human beings.
   iv. To facilitate the development of a Holistic perspective among students towards life and profession as well as towards happiness and prosperity based on a correct understanding of the Human reality and the rest of existence. Such a holistic perspective forms the basis of Universal Human Values and movement towards value-based living in a natural way.
   v. Highlight the ethical implications of a holistic understanding, fostering trustful and mutually fulfilling human behavior and a mutually enriching interaction with nature.
   vi. This course is intended to provide a much-needed orientation input in value education to the young enquiring minds.

3. Teaching methodology and evaluation system for the course:
   Teaching methodology –Lectures and Presentations, Interactive Discussions and Case Studies, Guest Lectures and Group work.
   Evaluation System –
   Total Marks: 100 [40(CIA) + 60% of (ESE)]
   CIA1: 40 MARKS (25 marks written class test, 15 marks Attendance/assignment)
   CIA2: 40 MARKS (25 marks written class test, 15 marks Attendance/assignment)
   Final exam: 60 marks ESE (Written Examination) Final comprehensive exam of 3hrs, covering the entire syllabus. The paper includes 5 compulsory questions (20 marks each). Each question must contain sub-parts derived from different Course Outcomes (COs).
4. Course Content:
   Course Name: UNIVERSAL HUMAN VALUES
   Course Code: CE(HSMC)301
   Hours per Week: 2L: 1T:0P
   Credits: 3

Module	Topics	28L+14T
10.	Introduction to Value Education: Understanding Value Education, self-exploration, and holistic development's role in education. Continuous Happiness and Prosperity: Basic Human Aspirations and current scenario.Methods to fulfill these basic aspirations.	6L+3T
11.	Harmony in the Human Being: Understanding the human being as the coexistence of the Self and the Body. Distinguishing the needs of the Self and the Body. Viewing the Body as an instrument of the Self.	4L+2T
12.	Self-Regulation and Health: Ensuring self-regulation and health through harmony between the Self and the Body	2L+1T
13.	Harmony in the Family and Society: Harmony in the family, the basic unit of human interaction. 'Trust' as the foundational value in relationships and 'Respect' as right evaluation. Justice in human-to-human relationships and vision for Universal Human Order.	6L+3T

Module	Topics	28L+14T
14.	Harmony in Nature/Existence: Understanding the interconnectedness and self-regulation among the four orders of nature. Realizing existence as coexistence at all levels. Holistic perception of harmony in existence.	4L+2T
20.	Implications of Holistic Understanding – Professional Ethics: Natural acceptance of human values and definitiveness of ethical human conduct. Basis for humanistic education and universal human order. Competence in professional ethics, holistic technologies, and value-based living strategies.	6L+3T

References:

Text Book:

- The Textbook A Foundation Course in Human Values and Professional Ethics, R R Gaur, R Asthana, G P Bagaria, 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978- 93-87034- 47-1.
- The Teacher‟s Manual for A Foundation Course in Human Values and Professional Ethics, R R Gaur, R Asthana, G P Bagaria, 2nd Revised Edition, ExcelBooks, New Delhi, 2019. ISBN 978-93-87034-53
- Professional Ethics and Human Values, Premvir Kapoor, ISBN: 978-93-86173-652, Khanna Book Publishing Company, New Delhi, 2022.

Reference Books:

- Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004.

Course Outcomes:

After completion of this course, the learners will be able to

Course Outcomes	Details/Statement	Action Verb	Knowledge Level
CE-305.1	Explain lack of understanding of human values is the root cause of most of the present-day problems.	Explain	Understand
CE-305.2	Distinguish their respective needs and view th e body as an instrument of the Self.	Distinguis h	Analyse
CE-305.3	Recognize self-regulation and health by fostering harmony be tween the Self and the Body.	Recognize	Understand
CE-305.4	Use harmony comes from competence and right evaluation, resolving societal issues through shared potential and aspirations.	Use	Apply
CE-305.5	Differentiate between the characteristics and activities of different orders and study the mutual fulfillment among them.	Differentia te	Analyse
CE-305.6	Demonstrate sustainable solutions to the problems in society and nature. They are also able to see that these solutions are practicable and draw roadmaps to achieve them.	Demonstr ate	Apply

21. Mapping of course outcomes to module / course content

Module	CO1	CO2	CO3	CO4	CO5	CO6
1	3	-	-	-	-	-
2	-	3	-	-	-	-
3	-	2	3		-	-
4	-	-	1	3	-	-
5	-	-	-	-	3	-
6	-	-	-	-	-	3

22. Mapping of the Course outcomes to Program Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	1	1	-	-	-	2	-	1	1	-	1
CO2	1	1	3	-	-	2	-	1	1	-	1
CO3	1	1	3	2	-	2	-	2	2	-	1
CO4	1	1	3	3	-	2	-	-	2	-	2
CO5	1	1	2	2	-	2	-	-	2	-	1
CO6	1	-	-	-	-	2	-	1	-	-	1

23. Mapping to PSO

	PSO1	PSO2	PSO3
CO1	3	2	2
CO2	3	3	2
CO3	3	2	2
CO4	3	2	2
CO5	2	2	2
CO6	3	1	2

Course Name: SOLID MECHANICS LABORATORY
Course Code: CE-391
(Semester III)
Category: Major
Course Broad Category: ENG SCIENCE (ES)

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1. Course Prerequisite:
   Solid Mechanics, Strength of Materials.

2. Course Learning Objectives:
   i. This course will provide students with hands-on experience in conducting mechanical tests on structural materials, including tension, compression, bending, torsion, hardness, impact, and fatigue tests, to evaluate their mechanical properties.
   ii. Students will learn to apply standard testing procedures and interpret experimental data, enabling them to analyze material behavior under various loading conditions and make informed engineering decisions.

3. Teaching methodology and evaluation system for the course:
   Teaching methodology – Hands on Laboratory session, Pre-lab Theoretical Lectures and Discussions, Problem solving sessions, Group Projects and Presentations and Lab Reports and Data Interpretation.
   Evaluation System –
   Total Marks: 100 [60(PCIA) + 40(PESE)]

Section 1: Practical Continuous Internal Assessment (PCIA) - 60 Marks (Continuous assessment, Attendance, viva)
Section 2: Practical End Semester Examination (PESE) - 40 Marks (written exam)

4. Course Content:
Course Name: Solid Mechanics Laboratory
Course Code: CE-391
Hours per Week: 0L:0T:2P
Credits: 1

Experiment	Topics	14P
1.	Tension Test on Structural Materials: Mild Steel and Tor steel (HYSD bars)	2P
2.	Compression Test on Structural Materials: Bricks	2P
3.	Bending Test on Mild Steel	2P
4.	Torsion Test on Mild Steel Circular Bar	1P
5.	Hardness Tests: Brinnel and Rockwell Tests	2P
6.	Test on Closely Coiled Helical Spring for Tension and Compression	2P
7.	Impact Test: Izod and Charpy	2P
8.	Demonstration of Fatigue Test	1P

9. References:
Text Book:

- A. Singh, Modern Geotechnical Engineering, 3rd Ed., CBS Publishers, New Delhi, 1999.
- B.M. Das, Principles of Foundation Engineering, 5th Ed., Thomson Asia, Singapore, 2003.
- N. Som, Theory and Practice of Foundation Design, Prentice Hall, New Delhi, 2003.

10. Course Outcomes:

Course Outcomes	Details/Statement	Action Verb	Knowledge Level
CO1	Operate experimental techniques to conduct tension, compression, and bending tests on various structural materials (mild steel, HYSD bars and bricks) and examine the obtained test data to determine key mechanical properties (e.g., yield strength, ultimate tensile strength, modulus of elasticity).	Operate and Examine	Analyse
CO2	Execute the principles of torsion testing on mild steel circular bar andorganisethe key mechanical properties (shear modulus) using the test data.	Execute and Organise	Analyse
CO3	Implement the principles and procedures of Brinell and Rockwell hardness tests to find the hardness of various materials.	Implement	Apply

CO4	Demonstrate experimental techniques to conduct tests on closely coiled helical springs and examine the obtained data to determine key spring and spring material characteristics (spring stiffness, modulus of rigidity).	Demonstrate and Examine	Analyse
CO5	Interpretation principles and procedures of Izod and Charpy impact tests to get the impact strength of various materials.	Use	Apply
CO6	Explain the concepts of fatigue test.	Explain	Understand

11. Mapping of course outcomes to module / course content

Experiment	CO1	CO2	CO3	CO4	CO5	CO6
1	3	-	-	-	-	-
2	3	-	-	-	-	-
3	3	-	-	-	-	-
4	-	3	-	-	-	-
5	-	-	3	-	-	-
6	-	-	-	3	-	-
7	-	-	-	-	3	-
8	-	-	-	-	-	3

12. Mapping of the Course outcomes to Program Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	3	1	2	1	-	-	2	1	-	1
CO2	3	3	1	2	1	-	-	2	1	-	1
CO3	3	3	1	2	1	-	-	2	1	-	1
CO4	3	3	1	2	1	-	-	2	1	-	1
CO5	3	3	1	2	1	-	-	2	1	-	1
CO6	3	1	-	1	1	-	-	1	1	-	1

13. Mapping to PSO

	PSO1	PSO2	PSO3
CO1	3	1	1
CO2	3	1	1
CO3	3	-	-
CO4	3	1	1
CO5	3	1	-
CO6	3	1	2

Course Name: Concrete Technology Laboratory
Course Code: CE-392
(Semester III)
Category: Minor
Course Broad Category: CORE ENGG (Professional Core Courses)

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1. Course Prerequisite:
   CE-392 Concrete Technology.

2. Course Learning Objectives:
   The objective of this lab is to teach the student basic properties ingredients of concrete, fresh and hardened concrete properties and prepare mix design as per codal provisions.

3. Teaching methodology and evaluation system for the course:

   Teaching methodology – Emphasizes experiential learning through hands-on experiments, allowing students to explore material behavior and mix design directly.

   Evaluation System –
   Total Marks: 100 [60(PCIA) + 40(PESE)]
   Section 1: Practical Continuous Internal Assessment (PCIA) - 60 Marks (Includes practical performance, reports, and viva voce after each experiment.)
   Section 2: Practical End Semester Examination (PESE) - 40 Marks (Final comprehensive practical examination covering the entire syllabus.)
4. Course Content:
   Course Name: CONCRETE TECHNOLOGY
   LABORATORY
   Course Code: CE-392
   Hours per Week: 0L:0T:2P
   Credits: 1

Module	Topics
1	Test on Fine aggregates: Bulking, specific gravity, bulk density, percentage voids, fineness modulus. grading curve.
2	Test on Coarse aggregates: Specific gravity, bulk density, percentage voids, fineness modulus. grading curve.
3	Test on Cement: Normal consistency, fineness, Initial setting and final setting time of cement. Specific gravity, soundness and compressive strength of cement.
4	Test on Fresh Concrete: Concrete mix design, various workability tests – slump, compacting factor, vee-bee test.
5	Test on Hardened Concrete: Compressive strength on mortar and cube, spilt-tensile strength test, flexure test, NDT Tests (Rebound hammer and Ultra-sonic pulse velocity).

6. References:
   - Concrete Technology by M. S. Shetty. – S. Chand & Co. 2004
   - Concrete Technology by M.L. Gambhir. – Tata Mc. Graw Hill Publishers, New Delhi
   - Properties of Concrete by A. M. Neville Pearson 5th edition Education ltd 2016.
   - IS 456 (2000), Plain and Reinforced Concrete - Code of Practice, Bureau of Indian Standards (BIS), New Delhi, India.
   - IS 10262 (2019), Concrete Mix Proportioning – Guidelines, Bureau of Indian Standards (BIS), New Delhi, India.

7. Course Outcomes:

Course Outcomes	Details/Statement	Action Verb	Knowledge Level
CO1	Demonstrate the method and findings of tension and compression tests on concrete.	DEMONSTRATE	APPLY
CO2	Describe the concepts of different test on hardened concrete and different properties of cement.	DESCRIBE	UNDERSTAND
CO3	Calculate the specific gravity of concrete ingredients.	EXAMINE	ANALYSE
CO4	Calculate the mix proportion of high grade of concrete.	TEST	ANALYSE
CO5	Measure the workability of concrete mix.	DESIGN	CREATE
CO6	Investigate the quality of concrete.	INVESTIGATE	CREATE

8. Mapping of course outcomes to module / course content

Module	CO1	CO2	CO3	CO4	CO5	CO6
1	-	2	2	-	-	-
2	-	-	3	-	-	-
3	-	-	3	-	-	-
4	-	-	-	3	3	-
5	2	2	-	-	-	3

9.Mapping of the Course outcomes to Program Outcomes

	PO 1	PO 2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	1	0	1	1	1	0	1	1	0	1
CO2	2	1	0	1	1	1	0	1	1	0	1
CO3	2	3	1	1	2	1	0	2	1	0	1
CO4	2	3	2	1	2	1	0	2	1	0	1
CO5	3	3	1	1	2	2	1	2	2	0	1
CO6	3	3	2	3	3	3	1	3	2	1	1

10.Mapping to PSO

	PSO1	PSO2	PSO3
CO1	3	3	1
CO2	3	3	1
CO3	3	3	1
CO4	3	3	2
CO5	3	3	1
CO6	3	3	3

Course Name: Civil Engineering Materials, Testing & Evaluation Sessional
Course Code: CE-381
(Semester III)
Category: Major
Course Broad Category: CORE ENGG (Professional Core Courses)

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1. Course Prerequisite:
    - Knowledge of basic engineering materials and construction techniques.
    - Understanding of fundamental mechanics and material properties
2. Course Learning Objectives:

    By the end of the course, students will:
    1. Conduct standardized tests on various civil engineering materials to evaluate their mechanical properties.
    2. Interpret test results to assess material suitability for different construction applications.
    3. Develop practical skills in handling material testing equipment and reporting results.
    4. Apply testing methodologies to ensure the quality and performance of civil engineering materials.

3. Teaching methodology and evaluation system for the course:
    Teaching methodology –: Lab-based experiments demonstrations, discussions on testing procedures, hands-on practice with testing equipment, and real-life case studies.
    Evaluation System –
    Total Marks: 100 [60(PCIA) + 40(PESE)]
    Passing criteria: 50% and above
    Section 1: Practical Continuous Internal Assessment (PCIA) - 60 Marks
    Section 2: Practical End Semester Examination (PESE) - 40 Marks

4. Course Content:
    Course Name: Civil Engineering Materials, Testing & Evaluation Sessional
    Course Code: CE-381
    Hours per Week: 0L:1T:2P
    Credits: 2

Module	Topics	42L
1.	Introduction to Civil Engineering Material: Overview onmaterials, material selection & testing.	2L
2.	Tests on Bricks: Dimensions and shape evaluation, Water absorption test, Efflorescence test, Compressive strength test.	5L
3.	Tests on Aggregates (Coarse Aggregate and Sand): Sieve analysis, Aggregate impact value, Aggregate crushing value, Specific gravity, Flakiness and elongation index and water absorption test.	6L
4.	Tests on Concrete (Fresh and Hardened): Slump test for workability, Compaction factor test, Compressive strength of hardened concrete (cube test), Split tensile strength test and Flexural strength test.	6L
5.	Tests on Bitumen & Bituminous Mixes: Penetration test, Ductility test, Softening point test, Marshall stability test.	6L
6.	Quality Assessment & Testing of Timber:Surface soundness Test, Tensile test, 3-point flexure test.	5L

Module	Topics	42L
7.	Tests on Steel & Metals: Tensile strength test, Hardness test (Brinell and Rockwell), Impact test (Charpy and Izod)	6L
8.	Tests on Tiles, Glass, Paints, Other Special Materials, and Composites: Strength test of tiles, Paint & Coating test, strength test of composite materials and Glass quality assessment.	6L

9. References:

Text Books:

- M.L. Gambhir, "Concrete Technology: Theory and Practice," Tata McGraw-Hill
- S. K. Duggal, "Building Materials," New Age International
- S. S. Bhavikatti, "Testing of Materials,"Vikas Publishing House

Reference Books:

- A.M. Neville, "Properties of Concrete," Pearson Education
- P.K. Mehta and P.J.M. Monteiro, "Concrete: Microstructure, Properties, and Materials," McGraw-Hill

10. Course Outcomes:

Course Outcomes	Details/Statement	Action Verb	Knowledge Level
CO1	Examine the performance on a wide variety of Civil Engineering materials and conduct their tests.	Examine	Analyse
CO2	Define the mechanical properties of bricks, aggregates, concrete, bitumen, and polymers.	Define	Remember
CO3	Discuss the behavior of materials under loading conditions and environmental factors.	Discuss	Understand
CO4	Appraise the suitability of different materials for construction projects based on testing results.	Appraise	Evaluate
CO5	Execute quality control tests on construction materials to meet industry standards.	Execute	Apply
CO6	Develop hands-on experience with testing methods used in the evaluation of civil engineering materials.	Develop	Create

11. Mapping of course outcomes to module / course content

Module	CO1	CO2	CO3	CO4	CO5	CO6
1	1	-	-	-	-	3
2	2	3	-	-	-	1
3	2	3	-	3	1	1
4	1	-	-	3	1	2
5	3	2	-	-	3	-
6	-	-	3	-	-	-
7	-	1	-	-	-	-
8	-	1	-	1	2	-

12. Mapping of the Course outcomes to Program Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	2	1	1	1	-	-	-	-	-	1
CO2	3	3	2	2	1	-	-	-	-	-	1

CO3	3	3	3	2	2	1	-	-	-	-	1
CO4	3	3	2	3	2	1	-	-	-	-	1
CO5	3	3	2	3	3	1	-	-	-	-	1
CO6	3	3	2	3	3	3	-	-	-	-	1

13. Mapping to PSO

	PSO1	PSO2	PSO3
CO1	3	2	1
CO2	3	2	1
CO3	3	2	1
CO4	2	3	2
CO5	2	3	1
CO6	3	3	2

Course Name: BUILDING PLANNING AND COMPUTER-AIDED CIVIL ENGINEERING DRAWING SESSIONAL
Course Code: CE-382
(Semester III)
Category: Major
Course Broad Category: CORE ENGG (Professional Core Courses)

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1. Course Prerequisite:
   Class-XII level knowledge of Mathematics and Geometry; Undergraduate level introductory knowledge of Civil Engineering.

2. Course Learning Objectives:
   i. This course introduces the implementation of basic principles of planning of buildings.
   ii. Students will also be able to design and draw various constructional components of the buildings and plan various building services.

3. Teaching methodology and evaluation system for the course:
   Teaching methodology – Lectures and Presentations, Hands-on in AUTOCAD, Interactive Discussions and Case Studies and Guest Lectures.
   Evaluation System –
   Total Marks: 100 [60(PCIA) + 40(PESE)]
   Passing criteria: 50% and above
   Section 1: Practical Continuous Internal Assessment (PCIA) - 60 Marks
   Section 2: Practical End Semester Examination (PESE) - 40 Marks

4. Course Content:
   Course Name: Building Planning and Computer-Aided Civil Engineering Drawing Sessional
   Course Code: CE-382
   Hours per Week: 0L:1T:2P
   Credits: 2

Module	Topics	14T+28P
1.	INTRODUCTION TO BUILDING DRAWING: Introduction to concept of drawings, Interpretation of typical drawings, planning drawings to show information concisely and comprehensively, optimal layout of drawings and Scales.	3T+4P

2.	BASICS OF AUTOCAD: Commands: Initial settings, drawing aids, drawing basic entities, Modify commands, Layers, Text and Dimensioning, Blocks. Drawing presentation norms and standards, Elements of planning building drawing, Methods of making line drawing and detailed drawing. Site plan, floor plan, elevation and section drawing of small residential buildings. Foundation plan.	3T+6P
3.	BRICK BONDS IN MASONRY CONSTRUCTION: Types of sizes of various types of bricks, details of bricks used in construction, types of brick bonds used in construction and their specific advantages and disadvantages. Layout of various brick bonds in AUTOCAD.	2T+4P
4.	ISOMETRIC PROJECTION: Principles of isometrics, relation between true length and isometric length, steps for isometric projection in AUTOCAD.	2T+4P
5.	PERSPECTIVE VIEW: Purpose of Perspective View, Vanishing Point, Various components of Perspective view.	1T+2P
6.	INTRODUCTION TO REVIT: Overview of Revit, the procedures for carrying out a simple project in Revit.	3T+8P

5. References:

Text Book:

- M.G.Shah, Kale, Patki, Building Drawing with an Integrated Approach to Built Environment, Tata McGraw-Hill Education India, 5th edition, 2011, (ISBN: 9780071077873, 0071077871).
- Building Services Environmental And Electro Mechanical Services, Second Revised, 2014, (ISBN: 9788175259805).
- Scott Onstott, AutoCAD 2018 and AutoCAD LT 2018 Essentials, Wiley (2017), (ISBN:9788126569298)

Reference Books:

- Croome, J. D. & Roberts, B. M., "AIR-CONDITIONING AND VENTILATION OF BUILDINGS VOL-1". Pergamon Press, (ISBN: 0080247792)
- Bureau of Indian Standards, " HAND BOOK OF FUNCTIONAL REQUIREMENTS OF BUILDINGS, (SP-41 & SP- 32)", BIS 1987 and 1989, (SP-41: ISBN: 8170610117)

6. Course Outcomes:

Course Outcomes	Details/Statement	Action Verb	Knowledge Level
CO1	Discuss the basic concepts of drawing.	Discuss	Understand
CO2	Differentiate the various signs and symbols used in AUTOCAD.	Differentiate	Analyze
CO3	Compare the various types of masonry bonds.	Compare	Analyze
CO4	Describe isometric projection of a building.	Describe	Understand
CO5	Demonstrate perspective view and the concept of vanishing points.	Demonstrate	Apply
CO6	Defend the fundamentals of Building Information Modelling through REVIT.	Defend	Evaluate

7. Mapping of course outcomes to module / course content

Module	CO1	CO2	CO3	CO4	CO5	CO6
1	3	-	-	-	-	-
2	-	3	-	-	-	-
3	-	-	3	-	-	-

4	-	-	-	3	-	-
5	-	-	-	-	3	-
6	-	-	-	-	-	3

8. Mapping of the Course outcomes to Program Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	2	1	0	0	0	0	0	0	0	2
CO2	3	2	0	0	3	0	0	0	0	0	2
CO3	3	3	3	1	1	0	0	2	1	0	2
CO4	3	3	1	2	1	0	0	2	1	0	2
CO5	3	2	1	0	0	0	0	0	0	0	2
CO6	3	3	3	3	1	0	0	2	1	0	2

9. Mapping to PSO

	PSO1	PSO2	PSO3
CO1	3	1	1
CO2	3	1	1
CO3	3	1	1
CO4	3	1	1
CO5	3	1	1
CO6	3	1	1

Course Name: PROBLEM SOLVING USING PYTHON AND MATLAB LABORATORY
Course Code: CE-383 (Semester III)
Category: Minor
Course Broad Category: MULTIDISCIPLINARY OPEN ELECTIVES

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1. Course Prerequisite:
   Theoretical knowledge of Problem solving using Python and Matlab_CE(OE)301and basic knowledge in computer application.
2. Course Learning Objectives:

i. Understanding Fundamental Concepts: Students should grasp core programming concepts such as variables, data types, control structures (if statements, loops), functions, and error handling.

ii. Algorithmic Thinking: Encourage students to develop the ability to think algorithmically. They should learn to break down problems into smaller, manageable components and devise step-by-step solutions.

iii. Practical Application: Students should apply Python programming skills to solve real-world problems. This could involve coding exercises, projects, or challenges that require the application of concepts learned.

iv. Debugging and Testing: Emphasize the importance of debugging and testing code. Students should learn techniques for identifying and fixing errors, as well as how to writing test cases.

v. Collaboration and Communication: Foster teamwork by having students work in pairs or groups. They should practice explaining their thought processes and solutions to peers, enhancing their communication skills.

vi. Continuous Learning: Instill a mindset of continuous improvement. Encourage students to seek out new libraries, tools, and techniques in Python and stay updated on best practices.

3. Teaching methodology and evaluation system for the course: Teaching methodology –
   Hands-on practical in lab.
   Evaluation System –
   Total Marks : 100 [60(PCIA) + 40(Final)]
   PCIA: 60 Marks (Continuous Assessment, attendance, and viva voce)
   FINAL: 40 Marks (Written Exam)
4. Course Content:
   Course Name: Problem Solving Using Python and Matlab Laboratory
   Course Code: CE-383
   Hours per Week: 0L:1T:2P
   Credits: 2

Modules	Topics	14P + 14T
Module 1	Introduction: Overview on Problem-Solving using Python and Matlab. Python and Matlab basics (download and installation of Python and Matlab).	1P
Module 2	Theoretical concepts and hands-on practice through problem-solving on identifiers, keywords, statements, variables, operators, data types, indentation, comments, reading inputs, printing outputs, type conversions, the type ( ) function and its usage, and the concepts of dynamic and strongly typed language.	3P + 4T
Module 3	Theoretical concepts and hands-on practice through problem-solving on identifiers, keywords, statements, variables, operators, data types, indentation, comments, reading inputs, printing outputs, type conversions, the type( ) function and its usage, and the concepts of dynamic and strongly typed language.	2P + 4T
Module 4	Theoretical concepts and hands-on practice on files, regular expression operations, and solving basic problems in object-oriented programming.	2P + 2T
Module 5	Introduction to MATLAB, variables and data types, arrays and matrices, solving and understanding linear equations and matrix operations using MATLAB, basic plotting (2D & 3D), use of MATLAB toolboxes including Signal Processing Toolbox, and Simulink. Hands-on practice and problem-solving are integrated throughout the module using MATLAB.	4P + 2T
Module 6	Theoretical concepts and Hands-on practice and solving problemson Numerical Methods, Ordinary Differential Equations (ODEs)and Partial Differential Equations (PDEs), Trapezoidal rule and Simpson's rule, Eigenvalue problems, Euler's method, Runge-Kutta methods, Newton-Raphson method by using Python and Matlab. Hands-on practice on real life problems, application of Python and Matlab in engineering, e.g. analyzing survey or geotechnical data or modeling structural behavior etc.	2P + 2T

5. References:
   - Text Book: “Let us Python” by Kanetkar
   - Reference Books: Online sources, e.g. NPTEL, SWAYAM etc.
6. Course Outcomes:

Course Outcomes	Details/Statement	Action Verb	Knowledge Level
CE-383.1	Analyze and explain the problem and formulate algorithms for them.	Explain	Understand
CE-383.2	Select the algorithms to programs.	Identify, Select	Understand
CE-383.3	Understand and implement the correct syntax of logical expression, branch instruction, iteration.	Implement	Apply
CE-383.4	Design and apply array and pointer to solve problem.	Design	Create
CE-383.5	Identify the use of function, recursion.	Identify, Implement	Apply
CE-383.6	Build analytical skill and solve real time problems and can execute projects.	Create	Understand

7. Mapping of course outcomes to module / course content

Module	CO1	CO2	CO3	CO4	CO5	CO6
1	3	-	-	-	-	-
2	-	3	-	-	-	-
3	-	-	3	-	-	-
4	-	-	-	3	-	-
5	-	-	-	-	3	-
6	-	-	-	-	-	3

8. Mapping of the Course outcomes to Program Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	3	3	3	3	2	1	0	0	0	1
CO2	3	3	3	2	3	2	1	0	0	0	1
CO3	3	3	2	3	1	2	0	0	0	0	1
CO4	3	3	3	3	3	2	0	0	0	0	1
CO5	3	3	2	2	2	2	1	0	0	0	1
CO6	3	3	3	3	3	2	0	0	0	0	1

9. Mapping to PSO

	PSO1	PSO 2	PSO 3
CO1	3	3	2
CO2	3	3	2
CO3	3	3	2
CO4	3	3	2
CO5	3	3	2
CO6	3	3	2

Course Name: DISABILITY, ACCESSIBILITY AND UNIVERSAL DESIGN
Course Code: CE-384
(Semester III)
Category: Value Added Courses
Course Broad Category: Multi-Disciplinary Non-credit Course

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5. Course Prerequisite:
   Basic Sciences.

6. Course Learning Objectives:
   i. This course introduces the study of the basic concepts of disability, diversity, and accessibility in built environments.
   ii. Students will also learn the key policy frameworks for legislative and technical perspectives of access.
   iii. Also, this course helps students to develop an insight into the understanding of universal design as an approach.

7. Teaching methodology and evaluation system for the course:
   Teaching methodology –Lectures and Presentations, Interactive Discussions and Case Studies, and Guest Lectures.
   Evaluation System –
   Attendance: 20
   Internal Assessment (20 Marks)- Formative Continuous Assessment [Assignment]
   End-Semester Exam (60 Marks)- Summative Assessment.

8. Course Content:
   Course Name: Disability, Accessibility, and Universal Design.
   Course Code: CE-384
   Hours per Week: 3L:0T:0P
   Credits: 0

Module	Topics	42L
15.	Foundations of Disability and Accessibility: Introduction to Disability Studies: Social model vs. medical model.Types of disabilities and their impact on interaction with the built environment.Legal frameworks and accessibility standards (e.g., ADA, local building codes).The importance of inclusivity in civil engineering.	7L
16.	Principles of Universal Design: The seven principles of Universal Design and their application to civil engineering.Ergonomics and human factors in design.Inclusive design strategies for diverse user groups.	7L

Module	Topics	42L
17.	Accessible Infrastructure Design: Accessible pedestrian pathways and sidewalks: Ramps, curb cuts, tactile paving.Accessible transportation: Design of accessible public transportation systems, bus stops, and railway stations.Accessible buildings: Entrance design, accessible restrooms, elevators, and emergency egress.Accessible public spaces: Parks, recreational areas, and outdoor environments.Accessible road design.	7L
18.	Accessible Transportation Infrastructure: Design of accessible public transportation systems (bus stops, railway stations, etc.).Accessible road design, including parking and traffic control.Integration of accessibility into transportation planning and design.Emergency evacuation planning for people with disabilities.	7L
19.	Accessibility in Construction and Maintenance: Construction practices for ensuring accessibility.Inspection and evaluation of accessibility in existing infrastructure.Maintenance and retrofitting of infrastructure for improved accessibility.	7L
20.	Technology and Innovation: Assistive technologies and their role in accessibility.Emerging technologies for accessible infrastructure.Smart city applications for inclusive environments	7L

5. Course Outcomes:

After completion of this course, students will be able to

Course Outcomes	Details/Statement	Action Verb	Knowledge Level
CO1	Demonstrate a comprehensive understanding of relevant disability legislation and accessibility standards.	Demonstrate	Understand
CO2	Implement the principles of Universal Design and human factors engineering to create inclusive and accessible civil engineering designs.	Implement	Apply
CO3	Design accessible pedestrian pathways, sidewalks, public spaces, and outdoor environments, incorporating appropriate features such as ramps, tactile paving, and wayfinding systems.	Design	Analyse
CO4	Design accessible transportation infrastructure, including public transportation systems, roads, and related facilities, ensuring compliance with accessibility standards.	Design	Analyse
CO5	Integrate accessibility considerations into the design of buildings, including entrances, restrooms, elevators, and emergency egress systems.	Integrate	Apply
CO6	Utilize emerging technologies to enhance accessibility in existing infrastructure or in new civil engineering projects.	utilize	Apply

6. Mapping of course outcomes to module/course content

Module	CO1	CO2	CO3	CO4	CO5	CO6
1	3	-	-	-	-	-
2	-	3	-	-	-	-
3	-	-	3		-	-
4	-	-		3	-	-
5	-	-	-	-	3	-
6	-	-	-	-	-	3

7. Mapping of the Course outcomes to Program Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	-	-	-	-	-	-	-	-	-	-
CO2	3	3	2	-	-	-	-	-	-	-	-
CO3	3	3	3	2	-	-	-	-	-	-	-
CO4	3	3	3	2	-	-	-	-	-	-	-
CO5	3	3	3	3	1	-	-	-	-	-	1
CO6	3	3	3	3	1	-	-	-	-	-	2

8. Mapping to PSO

	PSO1	PSO2	PSO3
CO1	3	-	-
CO2	3	-	-
CO3	3	-	-
CO4	3	-	-
CO5	2	2	2
CO6	3	2	3