For the academic batch 2021-2025
Effective from A.Y. 2022-23

SCHEME OF INSTRUCTION AND EXAMINATION

B.E. (Civil Engineering) - IV SEMESTER

S. No.	Course Category	Course Title	Scheme of Instruction				Scheme of Examination		Credits
			L	T	Pr/Drg	Total Hours	CIE	SEE	
Theory Courses									
1	2HS403HS	Human Values and Professional Ethics	2	-	-	2	40	60	2
2	2ES403CS	Python Programming	2	-	-	2	40	60	3
3	2PC404CE	Mechanics of Materials and Structures	3	-	-	3	40	60	3
4	2PC305CE	Design of Reinforced Concrete Structures	3	-	-	3	40	60	3
5	2PC306CE	Fluid Mechanics	3	-	-	3	40	60	3
6	2PC307CE	Hydrology	2	-	-	2	40	60	2
7	2MC403HS	Constitution of India	2	-	-	2	40	60	-
Laboratory Courses									
8	2PC453CE	Mechanics of Materials Laboratory	-	-	2	2	40	60	1
9	2PC454CE	Building Drawing & Drafting Laboratory	-	-	2 x 3h	6	40	60	3
10	2ES453CS	Python Programming Lab	-	-	2	2	40	60	1
	PW	Practise School-1(Short Internship) [#]							
		Total	**17**	**0**	**10**	**27**			**21**

[#] To be conducted after the IV Semester in the Summer Vacation and to be evaluated in V Semester

Course code	Course Title	Core/ Elective					
2ES403CS	Python Programming	Core					
		L	**T**	**P/D**	**Credits**	**SEE**	**CIE**
		3	-	-	3	40	60

Prerequisite: Experience with a high-level language (C/C++, Java, MATLAB) is suggested. Prior knowledge of a scripting language (Perl, UNIX/Linux shells) and Object-Oriented concepts is helpful but not mandatory

Course Objectives: The objective of this course is to impart knowledge of

- To be able to introduce core programming basics and program design with functions using Python programming language.
- To understand a range of Object-Oriented Programming, as well as in-depth data and information processing techniques.
- To understand the high-performance programs designed to strengthen the practical expertise.

Course Outcomes:

After completion of the course, the student will be able to

CO1. Examine Python syntax and semantics and be fluent in the use of Python flow control and functions.

CO2. Demonstrate proficiency in handling Strings and File Systems.

CO3. Create, run and manipulate Python Programs using core data structures like Lists, Tuples and Dictionaries.

CO4. Interpret the concepts of Object-Oriented Programming as used in Python.

CO5. Create and animate a variety of shapes and develop an application with graphical user interface (GUI).

CO6. Implement exemplary applications related to Network Programming, Web Services and Databases in Python

UNIT 1

Introduction to Python: installing Python, basic syntax, interactive shell, editing, saving, and running a script. The concept of data types, variables, assignments, immutable variables, numerical types, arithmetic operators and expressions, comments in the program, understanding error messages. Conditions, Boolean logic, logical operators, ranges, Control statements.

UNIT 2

Strings and Files: Strings and text files, manipulating files and directories, os and sys modules, text files: reading/writing text and numbers from/to a file, creating and reading a formatted file (csv or tab-separated). String manipulations: subscript operator, indexing, slicing a string, strings and number system: converting strings to numbers and vice versa.

Lists, tuples, and dictionaries

basic list operators, replacing, inserting, removing an element, searching and sorting lists, dictionary literals, adding and removing keys, accessing and replacing values, traversing dictionaries.

UNIT 3

Design with functions: Hiding redundancy, complexity, arguments and return values, formal vs actual arguments, named arguments. Program structure and design. Recursive functions.

Classes and OOP: Classes, objects, attributes and methods, defining classes, design with classes, data modeling, persistent storage of objects, inheritance, polymorphism, operator overloading (_eq_, _str_, etc), abstract classes, exception handling, try block.

UNIT 4

Simple Algorithms and Data structures: Search Algorithms, Sorting Algorithms, Hash Tables

Simple Graphics and Image Processing: "turtle" module, simple 2d drawing - colors, shapes, digital images, image file formats, image processing Simple image manipulations with 'image' module (convert to bw, greyscale, blur, etc).

UNIT 5

Graphical user interfaces:

Event-driven programming paradigm, tkinter, module, creating simple GUI, buttons, labels, entry fields, dialogs, widget attributes - sizes, fonts, colors layouts, nested frames

Multithreading, Networks, and Client/Server Programming:
Introduction to HTML, interacting with remote HTML server, running html-based queries, downloading pages, CGI programming, programming a simple CGI form

Text Books

T1. Kenneth A. Lambert, "The Fundamentals of Python: First Programs", 2nd Ed., Cengage Learning, 2017
T2. John V Guttag. "Introduction to Computation and Programming Using Python", Prentice Hall of India, 2013

Reference Books:

R1. Mark Summerfield, "Programming in Python 3: A Complete introduction to the Python Language", Addison-Wesley Professional, 2009.
R2. Allen B. Downey, "Think Python: How to Think Like a Computer Scientist," 2nd edition, Updated for Python 3, Shroff O'Reilly Publishers, 2016
R3: NPTEL Course, Programming, Data Structures and Algorithms using Python,
Link: https://nptel.ac.in/courses/106106145
R4: NPTEL Course, The Joy of Computing using Python,
Link: https://nptel.ac.in/courses/106106182
R5: FOSSEE, Python,
Link: https://python.fossee.in/

Course code	Course Title	Core/ Elective					
2PC404CE	Mechanics of Materials and Structures	Core					
		L	**T**	**P/D**	**Credits**	**SEE**	**CIE**
		2	1	0	3	40	60

Prerequisite: Engineering Mechanics, Solid Mechanics

Course Objectives:

The objective of this course is to impart knowledge of

- Methods of evaluation of deflections of beams due to transverse loads
- Buckling of columns and various theories to evaluate the critical load for columns
- Analysis of unsymmetrical bending and the concept of shear centre
- Static and Kinematics Indeterminacy, Analysis of indeterminate beams by Force Method: Propped Cantilever, Fixed beam and Continuous Beams
- Evaluating the displacements and redundant forces in beams, indeterminate trusses and frames, using energy methods

Course Outcomes:

After completion of the course, the student will be able to

CO1.Calculate the deflections of determinate beams due to transverse loads by various methods

CO2. Evaluate the buckling/critical load of columns for various end conditions using different theories

CO3. Analyze the beams subjected to unsymmetrical bending and compute the location of the shear centre for various sections

CO4. Determine the static and kinematics indeterminacy of indeterminate structures and **analyze** propped cantilever, fixed beams and continuous beams using force method of analysis

CO5. Apply the energy principles and various energy methods to **analyze** beams, indeterminate trusses and frames to find deflections and redundant forces

Unit-I: (08 Hrs)

Deflections in Beams: Slope and deflection by double integration/Macaulay's method for cantilever, simply supported beams and overhanging beams carrying one, two point loads, uniformly distributed load and uniformly varying load over entire span. Moment area method and conjugate beam methods for beams with varying flexural rigidity.

Unit-II: (08 Hrs)

Columns and Struts: Euler's theory for long columns, different end conditions, equivalent length, Rankine's theory, Secant & Perry formula for eccentric loading.

Unsymmetric bending: Centroidal principal axes of section, moments of inertia referred to any set of rectangular axes, Stresses in beams subjected to unsymmetrical bending, principal axes, Resolution of bending moment into two rectangular axes through the centroid, Location of neutral axis.

Unit-III: (08 Hrs)

Shear Centre: Concept and importance of shear center, shear flow and determination of shear center of simple sections such as T sections and Channel sections with one axis of symmetry

Static and Kinematic indeterminacy: Determination of static and kinematic indeterminacy of beams, pin jointed frames (trusses) and rigid frames.

Unit-IV: (12 Hrs)

Propped Cantilevers: Cantilever beams on elastic and rigid props for point loads and uniformly distributed load only. Calculation of reactions, Bending moment and Shear force diagrams, and deflections.

Fixed Beams: Determination of shear force, bending moment slope and deflection in fixed beams with and without sinking of supports for point loads uniformly distributed load.

Continuous Beams: Determination of moments in continuous beams with and without sinking of

supports by theorem of three moments, bending moment and shear force diagrams.

Unit-V: (08 Hrs)

Energy Methods: Elastic Strain energy for various types of loading, Determination of deflections in statically determinate beams and trusses using Work-energy principle, Castigliano's theorems, Unit load method. Maxwell's theorem of reciprocal deflections, Betti's Law.

Redundant Trusses and Frames: Analysis of plane trusses with one degree of redundancy (internal /external) and plane frames with one degree of redundancy, Lack of fit and temperature effect.

Text Books

T1. R. K. Bansal, "A Textbook of Strength of Materials: Mechanics of Solids (S.I. Units), 6th Edition, Laxmi Publications Pvt. Ltd., 2018

T2. R.C. Hibbler, "Structural Analysis," 9th Edition, Pearson Education, 2017

Reference Books

R1. Ferdinand P Beer, E. Russell Johnston Jr., John T. DeWolf, David F. Mazurek and Sanjeev Sanghi, "Mechanics of Materials (SI Edition)," 8th Edition, McGraw-Hill, 2020.

R2. R. C. Hibbler, "Mechanics of Materials (SI Edition)," 9th Edition, Pearson, 2018.

R3. R. Subramanian, "Strength of Materials", 3rd Edition, Oxford University Press, New Delhi, 2016.

R4. S. S. Bhavikatti, "Structural Analysis – I," 5th Edition, Vikas Publishing House Pvt. Ltd., 2021

R5. Maganti Janardhana, K.U. Muthu, Azmi Ibrahim, M. Vijayanand, "Basic Structural Analysis," 3rd edition, Wiley Publishers, 2019

Course code	Course Title	Core/ Elective					
2PC405CE	Design of Reinforced Concrete Structures	Core					
		L	**T**	**P/D**	**Credits**	**SEE**	**CIE**
		3	1	0	3	40	60

Course Objectives: The objective of this course is to impart knowledge of

- The properties of concrete and steel and with the behavior of reinforced concrete as a structural material and IS codal provisions as applicable for the design
- Design philosophies
- Principles of structural design of Reinforced Concrete Members
- Hands- on- experience and skill to design structural Reinforced Concrete elements
- Safety measures that have to be incorporated in design of structural elements

Course Outcomes: After completion of the course, the student will be able to

CO1. Define the characteristic strength of materials and partial safety factors for load and materials & **Explain** the design philosophies of working stress method and Limit state method

CO.2 Apply the key concepts, theories and mathematical fundamentals to analyze and design the structural elements.

CO.3 Analyze the moment capacity of structural elements & design the structural elements for flexure, shear and torsion

CO.4 Examine the serviceability of structural elements

CO.5 Design simple structural members to be able to safely resist bending, shear, torsion, deflection and compression within the imposed factors of safety.

Unit-I: (10 Hrs)

Introduction: Materials used in reinforced concrete (Cement, sand, coarse aggregate, water and reinforcing bars). Introduction to Relevant IS codes (IS 456-2000, IS 875 part I to IV). Dead load, imposed load, wind load and earthquake load.

Working stress method: Design of Singly Reinforced beam: Balanced, under-reinforced and over reinforced sections

Limit State Method of Design: Introduction to the design of Concrete Structures using Limit state method of design. Design philosophies. Partial safety factors for material strength and Loads. Limit State of Collapse and Limit State of Serviceability.

Unit-II: (10 Hrs)

Limit state of Collapse – Flexure

Design of Singly Reinforced Beams: Assumption made in Limit state. Stress blocks Parameters, Moment of Resistance a singly reinforced section. Analysis and design of a singly reinforced section for flexure:

Design of Doubly Reinforced Beams: Analysis and Design for flexure a doubly reinforced rectangular section.

Design of T- Beams: Analysis and Design of Singly Reinforced T Beams for flexure Limit states of serviceability: Check for deflection and cracking.

Unit-III: (10 Hrs)

Limit State of Collapse – Shear & Torsion

Design of beam for Shear: Types of Shear failure of an R.C.C beam, Shear carrying capacity of a reinforced concrete Beam. Analysis and Design of a reinforced section for Shear.

Design of Beam for Torsion: Analysis of R.C.C beams for Torsion. Equivalent Shear and Equivalent Bending Moment. Design and detailing of R.C.C beam subjected to Torsion

Design of Beam for Bond: Flexural Bond, Anchorage (Development) Bond, Check for Bond Failure.

Unit-IV: (08 Hrs)

Design of Slabs: Types of Slabs: Design of one way and two-way slabs - Simply supported and continuous

slabs subjected to uniformly distributed loads, Detailing of reinforcement, Check for serviceability of slabs.
Design of stair cases: Types of stairs: Design and detailing of dog-legged stair cases

Unit-V: (08 Hrs)
Design of columns: Assumptions, Design of axially loaded circular, square and rectangular columns, Design of columns with uni-axial and bi-axial bending, interaction diagrams.
Design of footings: Design of isolated square, rectangular and circular footings and Design & Detailing of combined Rectangular RCC footings.

Text Books

T1. A.K Jain, "Reinforced Concrete- Limit State Design", 7th edition, Nem Chand and Bros publications, 2012. (Unit 1-5)
T2. Neelam Sharma, "Reinforced Cement concrete Design" S.K. Kataria and Sons publications 2017 (Unit 1-5)

References/ Suggested Reading

R1. V. L. Shah and S. R. Karve, "Limit State Theory and Design of Reinforced Concrete", Structures Publications, 7th Edition, 2014.
R2:N. Krishna Raju, "Design of Reinforced Concrete Structures", CBS Publishers and Distributors, New Delhi, 4th edition, 2016

Relevant IS Codes:

1) IS: 456-2000, "Code of Practice for Plain and Reinforced concrete", Bureau of Indian Standards, New Delhi, India.
2) SP 16, "Design Aids for Reinforced Concrete to IS 456:1978", Bureau of Indian Standards, New Delhi, India
3) SP 24, "Explanatory Handbook on Indian Standard Code of Practice for Plain and Reinforced Concrete to IS 456:1978", Bureau of Indian Standards, New Delhi, India
4) SP 34, "Handbook on Concrete Reinforcement and Detailing (With Amendment 1)", Bureau of Indian Standards, New Delhi, India
5) IS: 875-1987, "Code of Practice For Design Loads (Other Than Earthquake) For Buildings And Structures Parts (1, 2, 3, 4 & 5)", Bureau of Indian Standards, New Delhi, India

Course code	Course Title	Core/ Elective					
2PC406CE	Fluid Mechanics	Core					
		L	**T**	**P/D**	**Credits**	**SEE**	**CIE**
		3	0	0	3	40	60

Prerequisite: Engineering Mechanics

Course Objectives:	**Course Outcomes**:
The objective of this course is to impart knowledge of ➢ The properties of fluid, Fluid pressure, pressure measurements and problems in fluid statics ➢ The concepts of fluid mechanics–statics, kinematics and dynamics ➢ The fluid kinematics, including types of flows, fluid path lines and continuity equations ➢ The principles of fluid dynamics ➢ The flow measurement devices and applications	After completion of the course, the student will be able to **CO1.** . Elucidate the fluids and different properties of fluids. **CO2**. Relate types of flows with the corresponding mathematical equations **CO3**. Solve the problems on pressure calculations, hydrostatic forces on bodies and buoyancy **CO4**. Make use of Euler's, Bernoulli's and Momentum equation to solve fluid dynamic problems **CO5**. Apply principles of fluid dynamics to make flow measurement calculations

Unit-I: (12 Hrs)

Fluid Properties: 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; vapour pressure, boiling point, cavitation; surface tension, capillarity, Bulk modulus of elasticity, compressibility.

Fluid Statics: Fluid Pressure: Pressure at a point, Pascal's law, Piezometer, Manometer, Differential Manometer, Micro manometers. Pressure gauges, transducers.

Unit-II: (10 Hrs)

Fluid Kinematics: Classification of fluid flow-steady and unsteady flow, uniform and non-uniform flow, laminar and turbulent flow, rotational and irrational flow, compressible and incompressible flow, ideal and real fluid flow, one, two-and three-dimensional flows. Streamline, pathline, streakline and stream tube.

Law of mass conservation: Continuity equation from control volume and system analysis. Definition and properties of Stream function, velocity potential function and uses of flow nets.

Unit-III: (10 Hrs)

Fluid Dynamics: Convective and local acceleration. Surface and body forces. Euler's equations of motion.

Law of energy Conservation: Bernoulli's equation from Euler's equation. Application of Bernoulli's equation.

Vortex flow- definition, types-free vortex and forced vortex motion.

Unit-IV: (08 Hrs)

Measurement of Velocity: Pitot Static Tube, hot wire anemometer.

Measurement of discharge in pressure conduits: Venturimeter, orifice meter, orifices, mouth pieces, nozzle meter, elbow meter and rotameter.

Measurement of discharge in free surface flows: Notches and weirs, spillways.

Measurement of discharge in tanks: orifices (free discharging and submerged), mouth pieces (external cylindrical and Borda's mouthpiece).

Unit-V: (10 Hrs)

Dimensional Analysis and Hydraulic Similitude: Rayleigh method, Buckingham Pi theorem and Dimensionless groups. Hydraulic Similitude, Laws of similitude, Model studies, Types of models. Application

of dimensional analysis and model studies to fluid flow problems.

Text Books

T1. A. K. Jain, "Fluid Mechanics," Khanna Publishers, 2018
T2. B. S. Pani, "Fluid Mechanics: A Concise Introduction", PHI Publications, 2016.

Reference Books:

R1. P.M. Modi and S.M. Seth, "Hydraulics and Fluid Mechanics", Standard Book House, 2017
R2. K. Srinivas Raju and D. Nagesh Kumar, "Fluid Mechanics: Problem Solving using MATLAB", PHI Learning; 1st edition, 2020
R3. K. Subramanya, "Theory and Applications of Fluid Mechanics", Tata McGraw-Hill Publishing Company Ltd., New Delhi,1993

Course code	Course Title	Core/ Elective					
2PC407CE	Hydrology	Core					
		L	**T**	**P/D**	**Credits**	**SEE**	**CIE**
		3	0	0	3	40	60

Prerequisite: Hydrology

Course Objectives:	**Course Outcomes**:
The objective of this course is to impart knowledge of ➢ Importance of Hydrology and its applications ➢ Introduction to Hydrological processes and estimation of Design flood ➢ Assessment of soil-water-plant relationship	After completion of the course, the student will be able to **CO1.** Outline the interaction among various processes in the hydrologic cycle **CO2.** Net evaporation rate from waterbodies with free surface bodies **CO3.** Develop the Rainfall – Runoff relationship **CO4.** Evaluate drawdown and yield in aquifers **CO5.** Estimate the Design flood for Water Resources Structures

Unit-I: (08 Hrs)
Introduction – Hydrologic cycle, Importance, and application of hydrology.
Precipitation – Forms of precipitation, types of rainfall, Characteristics of precipitation in India, measurement of rainfall, types of rain gauges, rain gauge network design, water shed, mean rainfall over an area, estimation of missing precipitation data, presentation of rainfall data, probable maximum precipitation (PMP).

Unit-II: (06 Hrs)
Abstractions from Precipitation- Evaporation process, evaporimeters, analytical methods of evaporation estimation, reservoir evaporation and methods for its reduction; Transpiration process; Evapotranspiration-measurement of evapotranspiration, evapotranspiration equations; Infiltration, infiltration capacity, measurement of infiltration, infiltration indices.

Unit-III: (08 Hrs)
Runoff- Definition, runoff process, factors affecting runoff, determination of runoff volume by empirical formulae, rational method, SCS-CN method, UNIT hydrograph method (def, limitation, application, derivation of unit hydrograph from direct runoff hydrograph and vice versa).

Unit-IV: (08 Hrs)
Ground Water-Forms of sub surface water, vertical distribution of sub surface water, geologic formations of aquifers, saturated formation, types of aquifers, aquifer properties, Darcy's law, types of wells, steady radial flow into wells in confined and unconfined aquifer, yield of open wells, safe yield, constant level pumping test and recuperation test.

Unit-V: (08 Hrs)
Floods: Definition, causes and impact of floods, control measures of floods, estimation of floods, flood frequency studies- Weibul's and Gumble's method, Introduction to flood routing and its importance, methods of flood routing.

Textbooks

T1. K. Subramanya, "Engineering Hydrology",4th Edition Tata McGraw Hill Publishing Co.Ltd. 2017.
T2. H.M. Raghunath, "Hydrology – Principles, Analysis and Design", 3rd Edition New Age International Publishers, 2015.

Reference Books:

R1. K.C.Patra, "Hydrology & Water Resources Engineering", 2nd Edition Alpha Science International Ltd., 2008.
R2. C.S.P.Ojha, P. Bhunya, R. Berndtsson, "Engineering Hydrology" Oxford University Press, 2008.

Course code	Course Title	Core/ Elective					
2MC403HS	INDIAN CONSTITUTION (Common for all branches)	Mandatory					
		L	T	P/D	Credits	CIE	SEE
		2	0	0	0	40	60

Course Objectives: The objective of this course is:

- To create awareness and relevance of the Indian Constitution, its directive principles.
- To impart understanding of the role, powers and functions of administration at the Central, State and local levels.
- To expose students to the relations between Central/Federal, State and Provincial units, divisions of executive, legislative and judiciary in them.
- To impart knowledge about the statutory institutions and their role.

Course Outcomes: After completion of the course, the student will be able to

CO1. Have a general knowledge and back ground about the Constitution of India and its importance.

CO.2 Will distinguish and understand the working of the Central, state and provincial levels of administration.

CO.3 Will be conscious about the fundamental duties, responsibilities and rights as an ideal citizen of India

CO.4 Will be able to perceive and interpret the functioning and distribution of resources between Centre and state.

CO.5 Have an awareness and relate to the existing hierarchy of the social structure, election process and Grievance redressal in a democracy.

Unit-I: (12 Hrs)

Introduction to Constitution- Meaning, reasons for having a constitution.

Evolution of the Indian Constitution: History, 1909 Act,1919 Act and 1935 Act.

Constituent Assembly: Composition and Functions;

Preamble- its importance and key words; Fundamental features of the Indian Constitution, Emergency powers

Unit-II: (10 Hrs)

Style of Governance adopted, Structure of the Indian Union, Relationship between bodies in hierarchy.

- **Union Government:** Executive-President, Prime Minister, Council of Minister-role, position and powers.
- **State Government:** Executive: Governor, Chief Minister, Council of Minister -role, position and powers.
- **Local Government:** Panchayat Raj Institutions, Rural and Urban local bodies-composition, role, position and powers.

Unit-III: (10 Hrs)

- **Rights and Duties:** Fundamental Rights- importance and salient features
- **Directive principles of State** Policy-meaning and purpose, classification, importance and implementation
- **Fundamental Duties** of a good citizen

Unit-IV: (08 Hrs)

Relation between Federal and Provincial units:

- **Union-State relations:** Administrative, legislative and Financial, Inter-State council, NITI Ayog, Finance Commission of India.
- **Judiciary:** Meaning and Functions, Conditions of independence of judiciary, Composition and powers of Supreme court, judicial activism and judicial restraint.

Unit-V: (10 Hrs)

- **Constitutional bodies:** Finance Commission, the UPSC, the Election Commission, the CAG, National Commissions for SCs and STs, etc.
- **Statutory Institutions:** Securities & Exchange Board of India, National Human Rights Commission, National Commission for Women, National Commission for Minorities, National Green Tribunal, National Commission for Protection of Child Rights etc.

Text Books

T1. Durga Das Basu, "Introduction to the Constitution of India," 25th Edition, Lexis Nexis, New Delhi, 2021.
T2. P M Bhakshi, "The Constitution of India," Universal Law Publishing - 2017
T3. Subhash Kashyap, "Our Parliament," National Book Trust, New Delhi

References/ Suggested Reading

R1. P. Ghosh, "Indian Government and Politics" Prentice Hall India Learning Private Limited, 2012.
R2. B.L. Fadia, Kuldeep Fadia, "Indian Government and Politics," Sahithya Bhavan Publications, 2013

Course code	Course Title	Core/ Elective					
2PC453CE	Mechanics of Materials Laboratory	Core					
		L	T	P/D	Credits	SEE	CIE
		0	0	2	1	40	60

Prerequisite: Mechanics of Materials

Course Objectives: The objective of this course is to make the student

- To understand stress- strain behavior of ductile materials
- To identify hardness number of different metals used in civil engineering practices
- To study deflection for different types of beams for different materials
- To know the rigidity modulus by conducting spring and torsion test
- To evaluate impact properties and energy absorption of mild steel material.

Course Outcomes: After completion of the course, the student will be able to

CO.1. **Appraise** the behaviour of a ductile material under direct tension test, in addition to gaining knowledge on elastic properties of the material.

CO.2. **Identify** the hardness of various metals like brass, copper, aluminum etc

CO.3 Assess and **understand** the flexural properties of beams (simply supported, cantilever and fixed) of different materials like wood, steel, copper, aluminum etc

CO.4. Interpret the application of tension and compression springs in practice to understand the properties like stiffness, capacity, shear modulus etc. of the springs

CO.5. **Understanding** the impact properties of the materials and also energy absorption.

List of Experiments:

1. Uni- axial tension test on a specimen of ductile material.
2. Stress – Strain characteristics of a ductile material.
3. Brinell`s hardness test.
4. Izod impact test
5. Compression test on open coiled helical spring.
6. Torsion test on a specimen of ductile material.
7. Bending test on simply supported beam of Timber
8. Bending test on Simply supported beam of Steel.
9. Bending test on Cantilever beam of Aluminum.
10. Bending test on Fixed beam of copper.

Additional Experiments:

11. Tension test on closed coiled helical spring
12. Charpy impact test.

Course code	Course Title	Core/ Elective					
2PC254CE	Building Drawing & Drafting Laboratory	Core					
		L	T	P/D	Credits	SEE	CIE
			0	6	3	40	60

Course Objectives:	Course Outcomes:
The objective of this course is to impart knowledge of ➢ The basic concepts of Building Drawing. ➢ Skill sets to prepare computer aided engineering drawings. ➢ Details of construction of different building elements. ➢ Visualizing the completed form of the building and the intricacies of construction based on the engineering drawings. ➢ To know the principles of planning of building.	After completion of the course, the student will be able to **CO1.** Illustrate the basic principles of building planning and drawings as per codal provisions. **CO2.** Apply the tools of AUTOCAD software to prepare structural drawings of various building components. **CO3.** Draw plan, elevation and sectional drawings of residential buildings in AutoCAD software. **CO4.** Develop isometric views of Single storey. **CO5.** Develop isometric views of Double storey residential buildings.

Sheet No	Description of the Topic	Contact Hours	
		Lecture	Drawing
1	**Conventional Representation** of building elements and materials	1	2
2	**Brick Masonry Bonds** Detailed drawing (section and elevation) of English Bond and Flemish Bond in odd and even courses - One brick wall and one and half brick wall,	2	2
3	**Doors & Windows** Detailed drawing (plan, section and elevation) of doors and windows – framed paneled and glazed	2	2
4	**Staircase** Detailed drawing (plan, section and elevation) of different forms of staircases – open well and dog legged.	2	2
5	**Footings** Detailed drawing (Plan and section) of different types of footings	1	2
6	**Roofs and floors** Detailed drawing (section elevation) of different types of floors – cement concrete, terrazzo, mosaic, roofs- pitched , curved and flat	2	2
7	**Trusses** Detailed drawing (sectional elevation) of different types of roof trusses – king post, queen post.	2	2
Planning of buildings			
8	Classification of buildings, General requirements of site and building. Building codes, Acts and Bye-laws, Licensing of building works. Functional planning of building such as residential, institutional, public, commercial, industrial buildings, checking for circulation, ventilation, structural, preparing sketch plan, working drawing etc.	3	
Comprehensive drawing of buildings (Site plan, floor plan, elevation and sections in accordance with functional requirements for the following):			

Electrical, Plumbing and Sanitary Drawing of a Building.			
9	Single storey residential building,	2	2
10	Double storey residential building	2	2

Text Books

T1. Gurucharan Singh and Jagdish Singh, "Building Planning, Designing and Scheduling", Standard Publishers Delhi, 2020

T2. S. N. Lal, "Engineering Drawing with Introduction to Auto CAD", Cengage Learning India Pvt Ltd, New Delhi, 2018.

References Books:

R1. Malik R.S., Meo, G.S. "Civil Engineering Drawing", Computech Publication Ltd New Asian, 2009

R2. Sikka, V.B., "A Course in Civil Engineering Drawing", S. K. Kataria & Sons, 2013

R3. M.G. Shah, C.M. Kale and S.Y. Patki, "Building Drawing", Tata McGraw Hill Publishing Co. Ltd., New Delhi, 2009

R4. National Building Code, Bureau of Indian Standards, New Delhi, 2005.

Course code	Course Title	Core/ Elective					
2ES453CS	Python Programming Lab	Core					
		L	T	P/D	Credits	SEE	CIE
				2	1	40	60

Course Objectives: The objective of this course is to make the student

- To learn how to design and program using lists, tuples, and dictionaries.
- To learn how to use indexing and slicing to access data in Python programs.
- To learn structure and components of a Python and to read and write files.
- To learn how to design object-oriented programs with Python classes and Exception handling techniques.
- To learn how to design and build the GUI applications using python

Course Outcomes:

After completion of the course, the student will be able to

CO1. Develop solutions to simple computational problems using Python programs.

CO2. Solve problems using conditionals and loops in Python.

CO3. Develop Python programs by defining functions and calling them.

CO4. Use Python lists, tuples and dictionaries for representing compound data.

CO5. Develop Python programs for GUI applications

List of Experiments:

1. Develop program to demonstrate different number datatypes in python
2. Develop program to understand the control structures of python
3. Develop program on String manipulation
4. Develop program to perform various operations on files
5. Develop programs to learn different types of structures (list, dictionary, tuples) in python
6. Develop programs to learn concept of functions scoping, recursion and list mutability
7. Develop program to demonstrate classes and OOP principles
8. Develop programs for data structure algorithms using python – searching, sorting and hash tables
9. Develop programs to understand working of exception handling and assertions
10. Draw graphics using Turtle
11. Develop event driven GUI programs
12. Develop Program for demonstration client server communication

Text Books

T1. Kenneth A. Lambert, "The Fundamentals of Python: First Programs," 2nd Edition, Cengage Learning, 2017

T2. John V Guttag. "Introduction to Computation and Programming Using Python", Prentice Hall of India, 2013

Reference Books:

R1. Mark Summerfield, "Programming in Python 3: A Complete introduction to the Python Language", Addison-Wesley Professional, 2009.

R2. Allen B. Downey, "Think Python: How to Think Like a Computer Scientist", 2nd edition, Shroff/ O'Reilly Publishers, 2016

R3: NPTEL Course, Programming, Data Structures and Algorithms using Python
Link: https://nptel.ac.in/courses/106106145

R4: NPTEL Course, The Joy of Computing using Python,
Link: https://nptel.ac.in/courses/106106182

R5: FOSSEE, Python,
Link: https://python.fossee.in/