

SCHEME OF INSTRUCTION & EXAMINATION
B.E. (Civil Engineering) IV – SEMESTER

S. No.	Course Code	Course Title	Scheme of Instruction				Scheme of Examination			Credits
			L	T	P/D	Contact Hrs/Wk	CIE	SEE	Duration in Hrs	
Theory Courses										
1	MC111PO	Indian Constitution	2	-	-	2	30	70	3	-
2	HS201EG	Effective Technical Communication in English	3	-	-	3	30	70	3	3
3	HS202CM	Finance and Accounting	3	-	-	3	30	70	3	3
4	BS205MT	Mathematics – III	3	-	-	3	30	70	3	3
5	ES212ME	Elements of Mechanical Engineering	3	-	-	3	30	70	3	3
6	PC231CE	Mechanics of Materials and Structures	3	-	-	3	30	70	3	3
7	PC232CE	Fluid Mechanics	3	-	-	3	30	70	3	3
8	PC233CE	Materials: Testing and Evaluation	2	-	-	2	30	70	3	2
Practical/ Laboratory Courses										
9	PC261CE	Solid Mechanics Lab	-	-	2	2	25	50	3	1
10	PC262CE	Materials: Testing and Evaluation Lab	-	-	2	2	25	50	3	1
			22	-	04	26	290	660		22

HS: Humanities and Social Sciences

BS: Basic Science

ES: Engineering Science

MC: Mandatory Course

PC: Professional Core

L: Lecture

T: Tutorial

P: Practical

D: Drawing

CIE: Continuous Internal Evaluation

SEE: Semester End Evaluation (Univ. Exam)

PO: Political Science

EG: English

CM: Commerce

MT: Mathematics

CE: Civil Engineering

ME: Mechanical Engineering.

Note:

- Each contact hour is a clock hour
- The duration of the practical class is two hours, however it can be extended wherever necessary, to enable the student to complete the experiment.
- The students have to undergo a Summer Internship of two-week duration after IV – Semester and credits will be awarded in VII – Semester after evaluation.
- All mentioned **Mandatory Courses** for BE (All Branches) should be offered either in I – Semester or II – Semester only **from the academic year 2019-2020**.
- For those of the students admitted in BE (All Branches) during the academic year 2018-2019 the Mandatory Courses were not offered during the I – Semester or II – Semester may be compulsorily offered either in III – Semester or IV – Semester **for the academic year 2019-2020 only**.

Course Code	Course Title				Core/Elective		
MC111PO	Indian Constitution				Mandatory		
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-	2	-	-	-	30	70	-

Course Objectives

- To create awareness among students about the Indian Constitution.
- To acquaint the working conditions of union, state, local levels, their powers and functions.
- To create consciousness in the students on democratic values and principles articulated in the constitution.
- To expose the students on the relations between federal and provincial units.
- To divulge the students about the statutory institutions.

Course Outcomes

After completing this course, the student will

1. Know the background of the present constitution of India.
2. Understand the working of the union, state and local levels.
3. Gain consciousness on the fundamental rights and duties.
4. Be able to understand the functioning and distribution of financial resources between the centre and states.
5. Be exposed to the reality of hierarchical Indian social structure and the ways the grievances of the deprived sections can be addressed to raise human dignity in a democratic way.

UNIT-I

Evolution of the Indian Constitution: 1909 Act, 1919 Act and 1935 Act. Constituent Assembly: Composition and Functions; Fundamental features of the Indian Constitution.

UNIT-II

Union Government: Executive-President, Prime Minister, Council of Minister

State Government: Executive: Governor, Chief Minister, Council of Minister

Local Government: Panchayat Raj Institutions, Urban Government

UNIT-III

Rights and Duties: Fundamental Rights, Directive principles, Fundamental Duties

UNIT-IV

Relation between Federal and Provincial units: Union-State relations, Administrative, legislative and Financial, Inter State council, NITI Ayog, Finance Commission of India

UNIT-V

Statutory Institutions: Elections-Election Commission of India, National Human Rights Commission, National Commission for Women

Suggested Readings:

1. Abhay Prasad Singh & Krishna Murari, Constitutional Government and Democracy in India, Pearson Education, New Delhi, 2019
2. D.D. Basu, Introduction to the constitution of India, Lexis Nexis, New Delhi
3. Subhash Kashyap, Our Parliament, National Book Trust, New Delhi

4. Peu Ghosh, Indian Government & Politics, Prentice Hall of India, New Delhi
5. B.Z. Fadia & Kuldeep Fadia, Indian Government & Politics, Lexis Nexis, New Delhi

Course Code	Course Title				Core/Elective		
HS201EG	Effective Technical Communication in English				Core		
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-	3	-	-	-	30	70	3
<p>Course Objectives To expose the students to:</p> <ul style="list-style-type: none"> ➤ Features of technical communication ➤ Types of professional correspondence ➤ Techniques of report writing ➤ Basics of manual writing ➤ Aspects of data transfer and presentations. <p>Course Outcomes On successful completion of the course, the students would be able to:</p> <ol style="list-style-type: none"> 1. Handle technical communication effectively 2. Use different types of professional correspondence 3. Use various techniques of report writing 4. Acquire adequate skills of manual writing 5. Enhance their skills of information transfer and presentations 							

UNIT I

Definition and Features of Technical communication: Definition and features of technical communication (precision, relevance, format, style, use of visual aids), Differences between general writing and technical writing, Types of technical communication (oral and written)

UNIT II

Technical Writing-I (Official correspondence): Emails, IOM, Business letters, Business proposals.

UNIT III

Technical writing-II (Reports): Project report, Feasibility report, Progress report, Evaluation report.

UNIT IV

Technical writing- III (Manuals): Types of manuals, User manual, Product manual, Operations manual.

UNIT V

Information Transfer and Presentations: Non-verbal (bar diagram, flow chart, pie chart, tree diagram) to verbal (writing), Verbal (written) to non-verbal, Important aspects of oral and visual presentations.

Suggested reading:

1. Raman, Meenakshi & Sharma, Sangeeta. (2015). *Technical communication: Principles and Practice* (3rd ed.). New Delhi, OUP.
2. Rizvi, Ashraf, M. (2017). *Effective technical Communication* (2nd ed.). New Delhi, Tata McGraw Hill Education.
3. Sharma, R. C., & Mohan, Krishna. (2017). *Business Correspondence and Report Writing: A Practical Approach to Business & Technical Communication* (4th ed.). New Delhi, Tata McGraw Hill Education.

4. Tyagi, Kavita & Misra, Padma. (2011). *Advanced technical communication*. New Delhi, PHI Learning.
5. Jungk, Dale. (2004). *Applied writing for technicians*. New York, McGraw-Hill Higher Education.

Course Code	Course Title				Core/Elective		
HS202CM	Finance and Accounting				Core		
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-	3	-	-	-	30	70	3
<p>Course Objectives The course will introduce the students</p> <ul style="list-style-type: none"> ➤ To provide basic understanding of Financial and Accounting aspects of a business unit ➤ To provide understanding of the accounting aspects of business ➤ To provide understanding of financial statements ➤ To provide the understanding of financial system ➤ To provide inputs necessary to evaluate the viability of projects ➤ To provide the skills necessary to analyse the financial statements <p>Course Outcomes After successful completion of the course the students will be able to</p> <ol style="list-style-type: none"> 1. Evaluate the financial performance of the business unit. 2. Take decisions on selection of projects. 3. Take decisions on procurement of finances. 4. Analyse the liquidity, solvency and profitability of the business unit. 5. Evaluate the overall financial functioning of an enterprise. 							

UNIT-I

Basics of Accounting: Financial Accounting–Definition- Accounting Cycle – Journal - Ledger and Trial Balance-Cash Book-Bank Reconciliation Statement (including Problems)

UNIT-II

Final Accounts: Trading Account-Concept of Gross Profit- Profit and Loss Account-Concept of Net Profit-Balance Sheet (including problems with minor adjustments)

UNIT-III

Financial System and Markets: Financial System-Components-Role-Considerations of the investors and issuers- Role of Financial Intermediaries. Financial Markets-Players- Regulators and instruments - Money Markets Credit Market- Capital Market (Basics only)

UNIT-IV

Basics of Capital Budgeting techniques: Time Value of money- Compounding- Discounting- Future Value of single and multiple flows- Present Value of single and multiple Flows- Present Value of annuities- Financial Appraisal of Projects– Payback Period, ARR- NPV, Benefit Cost Ratio, IRR (simple ratios).

UNIT-V

Financial statement Analysis: Financial Statement Analysis- Importance-Users-Ratio Analysis-liquidity, solvency, turnover and profitability ratios.

Suggested Readings:

1. Satyanarayana. S.V. and Satish. D., Finance and Accounting for Engineering, Pearson Education
2. Rajasekharan, Financial Accounting, Pearson Education
3. Sharma.S.K. and Rachan Sareen, Financial Management, Sultan Chand

4. Jonathan Berk, Fundamentals of Corporate Finance, Pearson Education
5. Sharan, Fundamentals of Financial Management, Pearson Education

Course Code	Course Title				Core/Elective		
BS205MT	Mathematics – III				Core		
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-	3	-	-	-	30	70	3
Course Objectives <ul style="list-style-type: none"> ➤ To introduce the solution methodologies for second order Partial Differential Equations with applications in engineering ➤ To provide an overview of probability and statistics to engineers Course Outcomes <p>After completing this course, the student will be able to:</p> <ol style="list-style-type: none"> 1. Solve field problems in engineering involving PDEs. 2. They can also formulate and solve problems involving random variables and apply statistical methods for analysing experimental data. 							

UNIT - I

Definition of Partial Differential Equations, First order partial differential equations, solutions of first order linear PDEs; Solution to homogenous and non-homogenous linear partial differential equations of second order by complimentary function and particular integral method.

UNIT - II

Second-order linear equations and their classification, Initial and boundary conditions, D'Alembert's solution of the wave equation; Heat diffusion and vibration problems, Separation of variables method to simple problems in Cartesian coordinates. The Laplacian in plane, one dimensional diffusion equation and its solution by separation of variables.

UNIT - III

Discrete random variables, expectation of discrete random variables, moments, variance of a sum, continuous random variables & their properties, distribution- functions, and densities.

UNIT - IV

Basic Statistics, Measures of Central tendency: Moments, skewness and Kurtosis – Probability distributions: Binomial, Poisson and Normal - evaluation of statistical parameters for these three distributions, Correlation and regression – Rank correlation. Curve fitting by the method of least squares- fitting of straight lines, second degree parabolas and more general curves.

UNIT - V

Test of significance; Large sample test for single proportion, difference of properties, Tests for single mean, difference of means, and difference of standard deviations. Test for ratio of variances – Chi- square test for goodness of fit and independence of attributes.

Suggested Readings:

1. B.S. Grewal, "Higher Engineering Mathematics", Khanna Publishers, 2000.
2. Advanced Engineering Mathematics, R.K. Jain & Iyengar, Narosa Publications.
3. Engineering Mathematics, P. Sivaramakrishna Das & C. Vijaya Kumar, Pearson India Education Services Pvt. Ltd.
4. N.P. Bali and M. Goyal, "A text book of Engineering Mathematics", Laxmi Publications, 2010.

5. E. Kreyszig, “Advanced Engineering Mathematics”, John Wiley & Sons, 2006.
6. P. G. Hoel, S. C. Port and C. J. Stone, “Introduction to Probability Theory”, Universal Book Stall, 2003.
7. S. Ross, “A First Course in Probability”, Pearson Education India, 2002.
8. W. Feller, “An Introduction to Probability Theory and its Applications”, Vol. 1, Wiley, 1968.
9. T. Veerarajan, “Engineering Mathematics”, Tata McGraw-Hill, New Delhi, 2010.
10. Mathematical Statistics, S.C. Gupta & V.K. Kapoor, S. Chand Publications.

Course Code	Course Title				Core/Elective		
ES212ME	Elements of Mechanical Engineering				Core		
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-	3	-	-	-	30	70	3
<p>Course Objectives</p> <ul style="list-style-type: none"> ➤ To learn certain fundamental topics related to mechanical engineering ➤ To understand and applications of thermodynamics. ➤ To understand the working principles of IC engines, gas turbines, hydraulic turbines and pumps. ➤ To understand the basic modes of heat transfer ➤ To familiarize the design and working principles of transmission Systems and various manufacturing processes. <p>Course Outcomes</p> <ol style="list-style-type: none"> 1. State and differentiate various classifications of IC engines and reciprocating air compressors with specific focus on similarities and differences between (i) 2 stroke and 4 stroke engines and (ii) CI and SI engines. Subsequently, the student would be able to compute the performance parameters of the engines and gas turbines. 2. Compare various types of heat transfer, analyse the governing equations, understand the applications of heat exchangers and solve related problems 3. Demonstrate the working principles of hydraulic turbines and pumps 4. Classify different types of power transmission systems like gears, gear trains, belts, ropes etc. with emphasis on their kinematic mechanisms and solve related problems 5. Understand various manufacturing processes like, welding, , machining, etc. and recognize their suitability for manufacturing of different industrial products 							

UNIT-I

IC Engines: Working of four stroke and two stroke petrol and diesel engine with p-V diagrams, valve timing diagram, calculation of indicated power, brake power, specific fuel consumption, mechanical and thermal efficiencies.

Gas Turbines: Classification, calculation of efficiency of simple open gas turbine cycle (joule cycle/Brayton cycle) and applications.

UNIT-II

Heat Transfer: Basic modes of heat transfer, Fourier's law of conduction, Newton's law of cooling, Stefan-Boltzmann law of radiation. One dimensional steady state conduction heat transfer through plane walls without heat generation.

Heat exchangers: Classification and application of heat exchangers in industry, derivation of LMTD in parallel and counter-flow heat exchangers and problems

UNIT-III

Hydraulic turbines: Classification, working principle, calculation of overall efficiencies of Pelton wheel and Francis turbines.

Hydraulic pumps: definition and classifications

Reciprocating pump: classification, working principle and limitations.

Centrifugal pump: classification, working principle and limitations

UNIT-IV

Power Transmission Elements: Gears: Definitions and uses of Spur, helical & Bevel gears.

Gear trains: Classifications and simple problems on simple/compound & Reverted gear train.

Belt drives: Definitions of velocity ratio, creep and slip, open and cross belt drives.

UNIT-V

Basic Manufacturing Processes:

Welding: Definitions and method of soldering, brazing and welding and differences. Brief description of Arc welding and Oxy- Acetylene welding.

Machining: Working mechanism of Lathe, Milling and grinding machines.

Additive Manufacturing: introduction to 3D printing and applications.

Suggested Readings:

1. R.K. Rajput "Thermal Engineering", Laxmi Publications, 2005
2. C. Sachdeva "Fundamentals of Engineering Heat and Mass transfer", Wiley Eastern Ltd, 2004.
3. P.N. Rao "Manufacturing Technology", Vol. 1 & 2, Tata McGraw, 2010.
4. S.S. Rattan, "Theory of Machines", Tata McGraw Hill, New Delhi 2010.
5. Bansal, R.K. Fluid Mechanics and Hydraulic Machines, Laxmi publications(p)ltd. Delhi, 1995

Course Code	Course Title				Core/Elective		
PC231CE	Mechanics of Materials and Structures				Core		
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-	3	-	-	-	30	70	3

Course Objectives

The objectives of the course are to impart knowledge of the:

- Phenomenon of buckling of columns using Euler's formula, secant and straight line formula.
- Methods of evaluation of deflections of beams due to transverse loads
- Analysis of indeterminate beams by applying the principles of equilibrium and compatibility in deformation.
- Concept of strain energy principle and its applications to evaluate the displacements and redundant forces using energy principles.
- Theory of arches and analyse them with varying degrees of indeterminacy

Course Outcomes

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

1. Evaluate the crippling load of columns for various end conditions using different formulas
2. Calculate the deflections of determinate beams due to transverse loads by various methods
3. Analyse statically indeterminate beams such as propped cantilever, fixed beams and continuous beams and draw the shear force and bending moment diagrams
4. Analyse the beams and frames and to find deflections by energy principle
5. Analyse the three hinged and two hinged arches, cables and suspension bridges

UNIT-I

Deflections in Beams: Slope and deflection by double integration 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 method.

UNIT-II

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

UNIT-III

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 - IV

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

UNIT-V

Elastic Theory of Arches: Eddy's theorem, three hinged parabolic and segmental arches, determination of horizontal thrust, bending moment, normal thrust and radial shear for static loading,

Two hinged arches: parabolic and segmental, determination of horizontal thrust, bending moment, normal thrust and radial shear for static loading.

Cables and Suspension bridges: Stresses in suspended loaded cables, length of cable, simple suspension bridge with 3-hinged stiffening girders for static load

Suggested Readings:

1. D.S. Prakash Rao, Strength of Materials- A Practical Approach, Universities Press, 1999.
2. R.K. Rajput, A Textbook of Strength of Materials, S. Chand Publications, 2007.
3. R. Subramanian, Strength of Materials, Oxford University Press, New Delhi 2005.
4. R.K. Bansal, Strength of materials, Laxmi Publications, New Delhi, 2010.
5. S. S. Bhavikatti, Strength of materials, Vikas Publishing House, Delhi, 2002.
6. S. S. Bhavikatti, Structural Analysis I & II, Vikas Publishing House, Delhi, 2002.
7. Devdas Menon, Structural Analysis, Narosa Publishing House, 2009.

Course Code	Course Title				Core/Elective		
PC232CE	Fluid Mechanics				Core		
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-	3	-	-	-	30	70	3

Course Objectives

The objectives of the course are to impart knowledge of:

- The concepts of fluid mechanics – statics, kinematics and dynamics
- The properties of fluid, pressure, pressure measurements and problems in fluid statics
- The fluid kinematics, including types of flows, fluid path lines and continuity equations
- The principles of fluid dynamics
- The flow measurement devices and applications

Course Outcomes

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

1. Classify the fluids based on their properties
2. Solve problems on pressure calculations, hydrostatic forces on bodies and buoyancy
3. Relate types of flows with the corresponding mathematical equations
4. Apply Euler's, Bernoulli's and Momentum equation to solve fluid dynamic problems
5. Apply principles of fluid dynamics to make flow measurement calculations

UNIT-I

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.

UNIT-II

Fluid Statics: Fluid Pressure: Pressure at a point, Pascal's law, Piezometer, U-Tube Manometer, Single Column Manometer, U-Tube Differential Manometer, Micro manometers. pressure gauges, Hydrostatic pressure and force: horizontal, vertical and inclined surfaces, Buoyancy and Meta-centre definitions

UNIT-III

Fluid Kinematics: Classification of fluid flow: steady and unsteady flow; uniform and non-uniform flow; laminar and turbulent flow; rotational and ir-rotational flow; compressible and incompressible flow; ideal and real fluid flow; one, two and three dimensional flows; vortex flows; Stream line, path line, streak line and stream tube; 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; Applications of Bernoulli's equation, Momentum principle; Forces exerted by Fluid flow on pipe bends.

UNIT-V

Flow Measurements: Measurement of discharge, Venturimeter, Orifice-meter, Nozzle meter, Elbow meter, Rotameter, Orifices and mouth pieces, Notches and weirs; Measurement of velocity, Piezometers.

Suggested Readings:

1. K. Subramanya, '*Theory and Applications of Fluid Mechanics*', Tata McGraw- Hill Publishing Company Ltd., New Delhi, 1993
2. Vijay Gupta and Santosh K. Gupta, '*Fluid Mechanics and its applications*', Wiley Eastern Ltd., New Delhi, 1984
3. K.L. Kumar, '*Engineering Fluid Mechanics*', Eurasia Publishing House Pvt Ltd., New Delhi, 2009
4. Vallentine, H.R., '*Applied Hydrodynamics*', Butterworths & Co Ltd., London, 1959

Course Code	Course Title				Core/Elective		
PC233CE	Materials: Testing and Evaluation				Core		
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-	2	-	-	-	30	70	2

Course Objectives

- To impart knowledge of basic building materials used in civil engineering
- To impart knowledge on properties and durability of concrete.
- To enable the students to understand the concept of mix design
- To impart knowledge on the special concretes
- To facilitate the students to know concreting under special circumstances

Course Outcomes

After completing this course, the student will be able to:

1. Know the properties of basic materials using in civil engineering
2. Remember the constituents required for making concrete.
3. Analyse the characteristics and properties of concrete
4. Apply the concepts of mix design for making concrete.
5. Implement various special concretes and concreting methods based on the scenario.

UNIT-I

Basic Construction Materials: Stones: Types and properties of natural stone materials, criteria for selection, Tests on stones, uses of stones, Treatment of stones; Bricks: classification, manufacturing types, tests; Timber: General characteristics of wood, defects of wood, preservation of wood and its applications, commercial forms of timber; Steel: types and properties, advantages and uses.

UNIT-II**Constituents of Concrete**

Cement: Ingredients, Manufacture, Chemical composition, basic properties of cement compounds, Hydration of cement- heat of hydration, physical properties of Portland cements, Indian standard tests and specification, various types and grades of cement, storage of cement.

Aggregates: Classification of aggregates based on size, shape, unit weight and its geological origin. Characteristics of aggregates, Strength of aggregate, particle shape and texture, specific gravity, bulk density, porosity, moisture content of aggregate, bulking of fine aggregate, deleterious substance in aggregate, soundness of aggregate, alkali-aggregate reaction, sieve analysis: - grading curves, fineness modulus, grading requirements, grading of fine and coarse aggregates, zoning, IS tests and specification for aggregates for concrete.

UNIT-III**Constituents of Concrete**

Water: General Requirements-quality of mixing water, effect of impurities in water on properties of concrete.

Admixtures: Additives and admixtures, types, necessity and benefit Mineral admixture: Fly ash, silica fume, blast furnace slag, and other pozzolanic materials. Chemical admixtures: Accelerator, retarder, water reducing elements, plasticizer and super-plasticizer, their functions and dosage. IS specification for admixtures for concrete.

UNIT-IV

Cement Concrete: Nominal and Design Mixes, steps of manufacture of concrete: proportioning, batching, mixing, transporting, placing, compacting, curing and finishing of concrete.

Studies on Fresh concrete: Workability: Definition, factor affecting workability, various tests as per IS code, Segregation and bleeding, stiffening, re-tempering. Curing- necessity and various methods, micro-cracking.

Studies on Hardened concrete: Testing on hardened concrete: Compression test, flexural strength of concrete, indirect tension test methods, factors influencing strength results, Accelerated strength tests, determination of modulus of elasticity, in-situ strength determination, variation in test results, Non- destructive strength tests: Ultrasonic pulse velocity tests, rebound hammer test.

UNIT-V

Miscellaneous Building Materials: Cement mortar plastering, Pointing, White and Colour washing, Paints and Varnishes. Types of Flooring. Miscellaneous materials like Glass, Bitumen, Polymers, Industrial waste products and Thin Wires.

Suggested readings:

1. P. C Varghese, Building Materials, Prentice Hall of India.
2. S.K. Duggal, Building Materials, 4th edition New Age Publication
3. M S Shetty; Concrete Technology, S. Chand Publication New Delhi
4. P. K. Mehta and Paulo J. M. Monteiro, "Concrete: microstructure, properties and materials", The McGrawHill Company
5. A R Santhakumar; Concrete Technology, Oxford University Press
6. A. M. Neville; Properties of Concrete, Pearson Education
7. Krishna Raju N., Design of Concrete Mixes, CBS publishers
8. IS 456-2000
9. IS 10262 – 2009
10. IS 269-1989
11. IS 516-1959
12. IS 1786-1985
13. IS 1893-2002
14. IS 12269-1987
15. IS 9103-1999
16. IS 8112-1989

Course Code	Course Title					Core/Elective	
PC261CE	Solid Mechanics Lab					Core	
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-	-	-	-	2	25	50	1

Course Objectives

- To understand the experiments on various materials to assess their behavior and limitations
- To learn the brittle and ductile material failure patterns
- To understand the shear force, bending moment and deflection for different types of beams
- To know the rigidity modulus by conducting spring and torsion test

Course Outcomes

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

1. Evaluate Young's modulus, rigidity modulus, hardness number, flexural rigidity and impact strength of given specimens
2. Find the cracking stress and compressive strength of bricks
3. Determine the stiffness of close coiled helical springs
4. Find the deflection of a beam

List of Experiments:**CYCLE – I**

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. Compression test on brick.
5. Bending test on simply supported beam of Timber.
6. Izod impact test

CYCLE – II

7. Compression test on close coiled helical spring.
8. Torsion test on a specimen of ductile material.
9. Bending test on Cantilever beam of Aluminium.
10. Bending test on Simply supported beam of Steel.
11. Bending test on Fixed beam of Copper.
12. Charpy impact test.

Note: At least 10 experiments should be conducted.

Course Code	Course Title					Core/Elective	
PC262CE	Materials: Testing and Evaluation Lab					Core	
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-	-	-	-	2	25	50	1

Course Objectives

- Testing of different materials under the action of various forces and determination of their characteristics experimentally.
- To make measurements of loads, displacements and strains relating these quantities.
- To know the strength and stiffness properties of structural elements.

Course Outcomes

After completing this course, the student will be able to:

1. Determine the physical properties of constituent materials of concrete.
2. Apply the mix design of concrete
3. Determine the workability of concrete
4. Determine the mechanical behavior of concrete subjected to Tension, compression, flexure by means of experiments.

List of Experiments

Tests on cement

1. Standard consistency of cement
2. Initial and final setting time of cement
3. Compressive strength of cement
4. Fineness of cement (by sieving)

Tests on aggregates (Fine aggregate & coarse aggregate)

5. Sieve analysis of aggregates
6. Fineness modulus, bulk density, void ratio and porosity
7. Bulking of fine aggregate (field and lab method)
8. Specific gravity of aggregate

Tests on fresh concrete

9. Slump test
10. Compaction factor test
11. Flow test

Tests on hardened concrete

12. Compressive strength of concrete
13. Modulus of elasticity of concrete
14. Flexural strength of concrete
15. Rebound hammer test

Tests on bricks

16. Compressive strength of burnt bricks
17. Water absorption tests on bricks

Note: At least 15 experiments should be conducted.