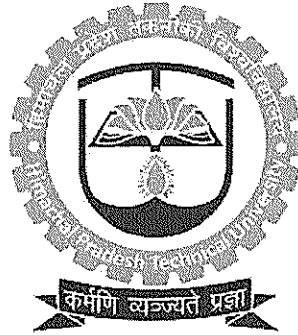


**HIMACHAL PRADESH TECHNICAL UNIVERSITY  
HAMIRPUR**



**Syllabus & Examination Scheme**

*for*

**B. Tech.**

**Civil Engineering**

**3<sup>rd</sup> to 8<sup>th</sup> Semester**

As per National Education Policy (NEP)-2020

(w.e.f. the Academic Year 2024-2025)

### Semester-III

Sr. No.	Category	Subject Code	Subject Title	L	T	P/D	Credits	Evaluation Scheme (Marks)		
								Internal Assessment (IA)	ESE	Subject Total
<b>Theory:</b>										
1	BS	MAFC-311	Probability Theory and Statistics	3	1	0	4	40	60	100
2	PC	CEPC-311	Solid Mechanics	3	1	0	4	40	60	100
3	PC	CEPC-312	Fluid Mechanics	3	0	0	3	40	60	100
4	PC	CEPC-313	Civil Engineering Materials, Construction and Drawing	2	0	0	2	40	60	100
5	PC	CEPC-314	Surveying and Geomatics	3	0	0	3	40	60	100
6	HS	HS-311	Engineering Economics	2	0	0	2	40	60	100
<b>Labs:</b>										
1	PC	CE-312P	Fluid Mechanics laboratory	0	0	2	1	30	20	50
2	PC	CE-313P	Civil Engineering Materials Laboratory	0	0	2	1	30	20	50
3	PC	CE-314P	Surveying and Geomatics Laboratory	0	0	2	1	30	20	50
4	PC	CE-315P	Computer- Aided Civil Engineering Drawing Laboratory	0	0	2	1	30	20	50
<b>Total</b>				<b>16</b>	<b>02</b>	<b>08</b>	<b>22</b>			<b>800</b>



Dean - Academic  
H.P. Technical University  
Hamirpur - 177 001, HP

## **SEMESTER-III**

MAFC-311 Probability Theory and Statistics							
Teaching Scheme			Credit	Marks Distribution			Duration of End Semester Examination
L	T	P		Internal Assessment	End Semester Examination	Total	
3	1	0	4	Maximum Marks: 40 Minimum Marks: 16	Maximum Marks: 60 Minimum Marks: 24	100 40	3 Hours

**Instructions to the question paper setter:** Question paper of end semester examination will be of 60 marks. The question paper will consist of five sections A, B, C, D and E. Sections A, B, C and D will have 2 questions of 12 marks each (Each subdivided into at least two equal sub-parts) and section E has short answer type questions consisting of six parts of 02 marks each or twelve parts of 01 marks each. The candidate will attempt five questions in all, i.e one question each from sections A, B, C, D and the section E will be compulsory. In the question paper, the questions available in sections A, B, C and D will be covered from Unit-I, Unit-II, Unit-III and Unit-IV respectively and section-E will cover whole syllabus

**Course Objective:**

- To understand the basic probability concepts.
- To have an in-depth knowledge of standard distribution which can describe real life phenomena.
- To understand and characterize phenomena which evolve with respect to time in probabilistic manner.
- To analyse the response of random inputs to linear time invariant systems.

**Unit-I:**

**Probability Theory:** Counting principles, probability axioms, sample space and events, conditional probability & Baye's Theorem. Random variable, discrete & continuous probability distribution, expectation, variance, standard deviation. Joint probability distribution, mass function, distribution function, marginal distribution function, covariance.

**Probability Distributions:** Discrete Probability Distributions: Uniform, Bernoulli, Binomial Distribution and Poisson distribution. Continuous Probability Distributions: Normal and exponential distribution.

**Unit-II:**

**Sampling and Testing of Hypothesis:**

Basic sampling models, sampling distribution of mean and standard deviation, testing of hypothesis, level of significance, confidence intervals for known and unknown means, simple sampling of attributes, tests of significance for large samples, comparison of large samples, central limit theorem, test of significance for two large samples. Student's t- test, Chi-square test, Goodness of fit, F-distribution..

**Unit-III:**

**Solution of System of Linear, Transcendental Equations & Interpolation**

Bisection method, Regula-Falsi method Newton Raphson's method, Gauss elimination method, LU factorization method.

Introduction to Interpolation. Lagrange's interpolation, Newton's divided difference interpolation, Difference operators and relations.

**Unit-IV:**

**Numerical Differentiation & Integration:** Numerical differentiation using forward difference, backward difference and central difference formula. Integration by trapezoidal and Simpson's rules  $1/3^{\text{rd}}$  and  $3/8^{\text{th}}$  rule.

**Numerical Solution of Ordinary Differential Equations:** Picard's method, Taylor series method, Euler's method, Modified Euler's method, Runge's and Runge- Kutta method..

**Course Learning Outcomes (CLOs):**

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

1. Develop understanding of basics of probability theory.

  
Dean - Academic  
J. J. Technological University

2. Identify different distribution functions and their relevance.
3. Apply the concepts of probability theory to different problems.
4. Understand different numerical integration techniques, and numerically solve differential equations.

**Textbooks:**

1. R.K. Jain and S.R.K. Iyengar, Advanced Engineering Mathematics (2003), 2nd ed.
2. B.S. Grewal, —Higher Engineering Mathematic, Khanna Publishers.
3. S.C. Gupta & V.K. Kapoor, Fundamentals of Mathematical Statistics, Sultan Chand & Sons.
4. K. E. Atkinson, An Introduction to Numerical Analysis (2nd edition), Wiley-India, 1989.
5. S.S. Sastry , Introductory Methods of Numerical Analysis, fifth Edition ,PHI learning Pvt. Ltd.

**References:**

1. Seymour Lipschutz, and John J. Schiller, Introduction to Probability and Statistics, Schaum's Outlines by Mc Graw Hill Education.
2. E. Kreyszig, Advanced engineering mathematics (8th Edition), John Wiley (1999).
3. H.K. Dass and Rajnish Verma, —Engineering Mathematic, S. Chand Publications.



Dean - Academic  
H.P. Technical University  
Hamirpur - 177 001, HP

CEPC-311 Solid Mechanics							
Teaching Scheme			Credit	Marks Distribution			Duration of End Semester Examination
L	T	P		Internal Assessment	End Semester Examination	Total	
3	1	0	4	Maximum Marks: 40	Maximum Marks: 60	100	3 Hours
				Minimum Marks: 16	Minimum Marks: 24	40	

**Instructions to the question paper setter:**

Question paper of end semester examination will be of 60 marks. The question paper will consist of five sections A, B, C, D and E. Sections A, B, C and D will have 2 questions of 12 marks each and section E has short answer type questions consisting of six parts of 02 marks each. The candidate will attempt five questions in all, i.e one question each from sections A, B, C, D and the compulsory question from section E. In the question paper, the questions available in sections A, B, C and D will be covered from Unit-I, Unit-II, Unit-III and Unit-IV respectively and section-E will cover whole syllabus.

**Course Objectives:**

- To understand the basic concepts of the stresses and strains for different materials and the strength of structural elements.
- To understand the development of internal forces and equilibrium
- To apply principles of mechanics to solve problems involving beams, columns, and other structural elements
- To analyse and understand principal stresses due to the combination of two-dimensional stresses on an element and failure mechanisms in materials.
- To evaluate the behavior of torsional members, columns and struts

Unit-I
<p><b>Introduction to Engineering Mechanics:</b> System of forces, free-body diagrams, equilibrium equations; Internal forces in structures; Frictions and their applications; Centroid of plane and composite bodies, Moment of inertia of plane area, Parallel Axes Theorem, Perpendicular axes theorems</p> <p><b>Properties of materials :</b> Introduction, normal stress, strain, tension test for mild steel, specification of specimen, stress-strain curve for tension, actual curve versus engineering curve intention, properties of metals (ductility, brittleness malleability and hardness), creep, elasticity ( proof stress), toughness fatigue.</p>
Unit-II
<p><b>Simple Stress &amp; Strain:</b> Hooke's law, stress and elongation produced in various types of bars due to its own weight and applied axial force, Poisson's ratio, relationship between elastic constants, stresses and elongation produced in simple &amp; composite bars due to axial, thermal loading.</p> <p><b>Principle Stress:</b> Principal plane, principal stresses in beams, analytical method, Mohr's circle method: properties of Mohr's circle, construction of Mohr's circle</p>
Unit-III
<p><b>Bending Moment and Shear Force Diagrams:</b> Type of supports and loading, Shear force and Bending moment, Sign convention, SF and BM diagrams for cantilevers, simply supported and overhanging beams under point loads, UDL, UVL and Couples, Point of contraflexure</p> <p><b>Bending Stresses and Shear Stresses in Beams:</b> Theory of pure bending, position of neutral axis, Bending equation, practical application of bending equation, variation of bending stress in Rectangular &amp; I sectional beams, shear stresses in beams, variation of shear stresses for Rectangular &amp; I sectional beams.</p>

  
 Dean - Academic  
 H.P. Technical University  
 Hamirpur - 177 001, HP

#### Unit-IV

**Torsion of Circular Shafts-** Introduction – Pure torsion-torsion equation of circular shafts, Strength and stiffness, Torsional rigidity and polar modulus.

**Theory of Columns and Struts** Types of Columns, Failure of Column, Euler's Column Theory, Slenderness Ratio, End Conditions for Long Columns, Equivalent Length of Columns, Limitation of Euler's Formula, Factor of Safety

#### Course Learning Outcomes (CLOs):

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

- Comprehend the fundamental concepts and principles of engineering mechanics, including system of forces, friction, centroid
- Identify the mechanical properties and behaviour of materials
- Apply concepts of stress, strain, and principle stresses in various elements
- Plot the variation of shear force and bending moments over the beams under different types of loads
- Assess bending and shear stresses in beams subjected to different loadings
- Evaluate the behavior of torsional members, columns and struts

#### Textbooks:

- R Engineering Mechanics: Nelson, McGraw Hill
- Popov, E. P., -Engineering Mechanics of Solids, SI Version, Prentice Hall, New Delhi
- Timoshenko, S. P. and Young, D. H., -Elements of Strength of Materials, East West Press, New Delhi
- Subramanyam, -Strength of Materials, Oxford University Press, Edition, 2008

#### Reference Books:

- Strength of Materials by Timoshenko, McGraw Hill
- Mechanics of Materials by E.J. Hearn, Butterworth-Heinemann
- Mechanics of Materials by Beer & Johnston, McGraw Hill
- Advanced Mechanics of Solids by L.S Srinath, McGraw Hill

#### e-Learning Resources:

- NPTEL courses, <http://nptel.iitm.ac.in/courses.php>, web and video courses on Strength of Materials by Sharma, S. C., and Harsha, S. P

  
Dean - Academic  
H.P. Technical University  
Hamirpur - 177 001, HP

CEPC-312 Fluid Mechanics							
Teaching Scheme			Credit	Marks Distribution			Duration of End Semester Examination
L	T	P		Internal Assessment	End Semester Examination	Total	
3	0	0	3	Maximum Marks: 40	Maximum Marks: 60	100	3 Hours
				Minimum Marks: 16	Minimum Marks: 24	40	

**Instructions to the question paper setter:**

Question paper of end semester examination will be of 60 marks. The question paper will consist of five sections A, B, C, D and E. Sections A, B, C and D will have 2 questions of 12 marks each and section E has short answer type questions consisting of six parts of 02 marks each. The candidate will attempt five questions in all, i.e one question each from sections A, B, C, D and the compulsory question from section E. In the question paper, the questions available in sections A, B, C and D will be covered from Unit-I, Unit-II, Unit-III and Unit-IV respectively and section-E will cover whole syllabus.

**Course Objectives:**

- Gain a comprehensive understanding of the fundamental principles governing fluid statics, kinematics, and dynamics, including the behavior of fluids at rest and in motion.
- Learn and accurately define essential terms and concepts used in fluid mechanics, such as viscosity, density, pressure, velocity, and flow rate.
- Identify and describe the different classifications of fluid flow, including laminar and turbulent flow, steady and unsteady flow, and compressible and incompressible flow.
- Utilize the principles of continuity, momentum, and energy to solve fluid mechanics problems, demonstrating the ability to apply these fundamental concepts to real-world scenarios.

Unit-I
<b>Properties of Fluids;</b> Basic Concepts and Definitions – Distinction between a fluid and a solid; Density, Specific weight, Specific gravity, Kinematic and dynamic viscosity; variation of viscosity with temperature, Newton law of viscosity; vapor pressure, boiling point, cavitation; surface tension, capillarity.
<b>Fluid Pressure;</b> Pressure at a point, Pascal's law, pressure variation with temperature, density and altitude. Piezometer, U-Tube Manometer, Single Column Manometer, U-Tube Differential Manometer, Micromanometers. pressure gauges, Hydrostatic pressure and force: horizontal, vertical and inclined surfaces.
Unit-II
<b>Fluid Kinematics-</b> Classification of fluid flow: steady and unsteady flow; uniform and non-uniform flow; laminar and turbulent flow; rotational and irrotational flow; compressible and incompressible flow; ideal and real fluid flow; one, two- and three-dimensional flows; Streamline, path line, streak line and stream tube; stream function, velocity potential function.
Unit-III
<b>Fluid Dynamics-</b> Surface and body forces; Equations of motion - Euler's equation, Bernoulli's equation – derivation; Energy Principle; Practical applications of Bernoulli's equation: venturi meter, orifice meter and pitot tube; Momentum principle; Vortex Flow – Free and Forced
Unit-IV
<b>Flow through Pipes-</b> Introduction, Major and minor energy losses, Darcy-Weisbach equation for head loss due to friction in a pipe, hydraulic gradient line and total energy line, pipes in series and parallel, equivalent pipes, Power transmission through pipes, water hammer phenomenon.
<b>Flow Measurements-</b> Introduction, Orifices - classification, hydraulic coefficients, Mouthpiece - classification, Borda's mouthpiece, Notches & Weirs –Introduction, classification, discharge over rectangular, triangular, trapezoidal notches, broad crested weirs, Cipolletti weir.

  
 Dean - Academic



**Course Learning Outcomes (CLOs):**

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

- Learn the broad principles of fluid statics, kinematics and dynamics.
- Understand definitions of the basic terms used in fluid mechanics.
- Understand classifications of fluid flow.
- Apply the continuity, momentum and energy principles.
- Estimate the discharge through pipe and fluid flow problems

**Textbooks:**

- Fluid Mechanics and Machinery, C.S.P.Ojha, R. Berndtsson and P. N. Chadramouli, Oxford University Press, 2010
- Hydraulics and Fluid Mechanics, P M Modi and S M Seth, Standard Book House
- Theory and Applications of Fluid Mechanics, K. Subramanya, Tata McGraw Hill
- Fluid Mechanics with Engineering Applications, R.L. Daugherty, J.B. Franzini and E.J. Finnemore, McGraw Hill.

**e-Learning Resources:**

- <https://nptel.ac.in/>
- <http://www.nitttrchd.ac.in/sitenew1/nctel/civil.php>
- [www.erp.himtu.ac.in](http://www.erp.himtu.ac.in) (e-Library of HPTU)

  
Dean - Academic  
H.P. Technical University  
Hamirpur - 177 001, HP

CEPC-313 Civil Engineering Materials, Construction and Drawing							
Teaching Scheme			Credit	Marks Distribution			Duration of End Semester Examination
L	T	P		Internal Assessment	End Semester Examination	Total	
2	0	0	2	Maximum Marks: 40	Maximum Marks: 60	100	3 Hours
				Minimum Marks: 16	Minimum Marks: 24	40	

**Instructions to the question paper setter:**

Question paper of end semester examination will be of 60 marks. The question paper will consist of five sections A, B, C, D and E. Sections A, B, C and D will have 2 questions of 12 marks each and section E has short answer type questions consisting of six parts of 02 marks each. The candidate will attempt five questions in all, i.e. one question each from sections A, B, C, D and the compulsory question from section E. In the question paper, the questions available in sections A, B, C and D will be covered from Unit-I, Unit-II, Unit-III and Unit-IV respectively and section-E will cover whole syllabus.

**Course Objectives:**

- To learn the fundamental concepts relevant to properties of Civil Engineering materials and their application.
- Develop a foundational understanding of the properties and behavior of common civil engineering materials
- To familiarize with parts of buildings and methods of building construction


**Pre-requisites:** Chemistry

<b>Unit-I</b>	<b>(06 hours)</b>
<b>Bricks:</b> Classification, fire bricks- properties and application. <b>Cement:</b> Composition, special types, grades, manufacturing of Ordinary Portland Cement, hydration of cement. <b>Fine and Coarse aggregate:</b> Source, classification, characteristics, applications in structures and pavements <b>Mortar:</b> Properties and types (clay, lime, cement, gauged and surkhi mortar) <b>Cement Concrete:</b> Composition, grades, types (brief about plain, reinforced concrete)	
<b>Unit-II</b>	
<b>Timber:</b> Classification, seasoning, defects, market forms and products <b>Paints and Varnishes –</b> Composition, properties and applications <b>Introduction to other modern materials:</b> Fiber glass reinforced plastic, acoustic materials, geo-textiles, laminates and adhesives	
<b>Unit-III</b>	<b>(06 hours)</b>
<b>Building Planning:</b> Classification of buildings; Site selection for buildings; Orientation of Buildings; Principles of planning of buildings; overview and importance of building Bye-Laws for planning of buildings <b>Structural Building Components:</b> Stone masonry: Types: Rubble Masonry and Ashlar Masonry; Brick masonry: Bonds (English, Flemish, Rat Trap); Floors: types of flooring (cement concrete, terrazzo, tiled, timber & stone flooring); Flat and Sloped roofs: types; Sill and Lintel bands; Staircases: types	
<b>Unit-IV</b>	<b>(06 hours)</b>
<b>Non-Structural Building Components:</b> Doors, Windows: types; Dampness and Water Proofing: causes of dampness, prevention methods. Electrical Services: requirements, components <b>Building Services:</b> Water supply and drainage: requirements, components; Fire protection: types of construction as per fire resistance, Fire resistive properties of materials, Requirement in buildings for safety against fire;	

**Course Learning Outcomes (CLOs):**

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

- Identify the properties of different materials used in civil engineering applications
- Assess the suitability and functional aspect of the materials
- Measure physical properties of common construction materials
- Evaluate the materials as per the specific requirements
- Identify and understand the specifications of various components of buildings
- Recognize the purposes of the primary building services and the corrective actions offered in building

  
 Dean - Academic  
 J. J. Technological University

**Textbooks:**

- Surendra Singh, "Building Materials", Vikas Publishing Company, New Delhi, 2002.
- Rajput, R.K., "Engineering Materials", S.Chand & Co. Ltd., New Delhi, 2000.
- Sharma S.K., "Civil Engineering Construction Materials", Khanna Publishing House.

**Reference Books:**

- Khanna, S.K., Justo, C.E.G and Veeraragavan, A, ' Highway Materials and Pavement Testing', Nem Chand & Bros
- Various related updated & recent standards of BIS, IRC, ASTM, RILEM, AASHTO, etc. corresponding to materials used for Civil Engineering applications.
- Er. M.K. Gupta (2019), Practical Handbook on Building Construction, A Nabhi Publication
- P.C. Varghese, Building Construction, PHI Learning
- Bureau of Indian Standards, " HAND BOOK OF FUNCTIONAL REQUIREMENTS OF BUILDINGS, (SP-41 & SP- 32)", BIS 1987 and 1989, (SP-41: ISBN: 8170610117)
- SP-35 (1987): Handbook of Water supply & drainage-BIS, (SP- 35: ISBN: 8170610095) 4.
- N.B.C.-2016, Volume 1 & 2, BIS, (ISBN: 8170610990)
- Building bye laws (local bodies)

**e-Learning Resources:**

- <https://archive.nptel.ac.in/courses/105/106/105106206/>
- NPTEL courses, <https://archive.nptel.ac.in/courses/105/102/105102088>, web and video courses on Building Materials and Construction

  
Dean - Academic  
H.P. Technical University  
Hamirpur - 177 001, HP

CEPC-314 Surveying and Geomatics							
Teaching Scheme			Credit	Marks Distribution			Duration of End Semester Examination
L	T	P		Internal Assessment	End Semester Examination	Total	
3	0	0	3	Maximum Marks: 40	Maximum Marks: 60	100	3 Hours
				Minimum Marks: 16	Minimum Marks: 24	40	

**Instructions to the question paper setter:**

Question paper of end semester examination will be of 60 marks. The question paper will consist of five sections A, B, C, D and E. Sections A, B, C and D will have 2 questions of 12 marks each and section E has short answer type questions consisting of six parts of 02 marks each. The candidate will attempt five questions in all, i.e one question each from sections A, B, C, D and the compulsory question from section E. In the question paper, the questions available in sections A, B, C and D will be covered from Unit-I, Unit-II, Unit-III and Unit-IV respectively and section-E will cover whole syllabus.

**Course Objectives:**

- To describe the function of surveying in civil engineering construction
- To work with survey observations, and perform calculations
- To identify the sources of measurement errors and mistakes; understand the difference between accuracy and precision as it relates to distance, differential leveling, and angular measurements

Unit-I
<p><b>Introduction to Surveying:</b> Principles, classification, units, scales, Linear measurement, ranging, Chain and tape measurement, Survey stations. Obstacles in chaining on sloping ground, errors and corrections-uses of cross staff and optical square. Maps - scale, coordinate system.</p> <p><b>Compass Survey:</b> Prismatic compass, surveyor's compass, whole circle and reduced bearing-true and magnetic bearing -dip and declination -local attraction, traversing -plotting -error of closure</p>
Unit-II
<p><b>Plane Table Surveying:</b> Definitions, uses and advantages, temporary adjustments. Different methods of plane table surveying; Two point and three-point problems. Errors in plane table survey.</p> <p><b>Levelling:</b> Definition, mean sea level, reduced level, types of levelling, bench marks, levelling instruments, sensitivity of bubble tube, temporary and permanent adjustments, corrections for refraction and curvature, longitudinal and cross sectioning levelling.</p> <p><b>Contour Survey:</b> definition, characteristics of contour, uses of contour, methods of contouring, direct and indirect interpolation</p>
Unit-III
<p><b>Curves:</b> Types of curves, Simple curves: elements of a simple curve, different methods for setting out of simple curves –linear and angular methods Transition curves; introduction, superelevation, equation of transition curve, length &amp; types of transition curve. Horizontal and Vertical curves–types, characteristics, length and setting out</p>
Unit-IV
<p><b>Theodolite Surveying:</b> Various parts and axis of transit theodolite, technical terms, temporary adjustments Measurement of horizontal and vertical angles -method of repetition and reiteration; Theodolite traverse - Different methods of running theodolite traverses, Gales's traverse table, balancing of traverse by Bow-Ditch's transit and modified transit rules <b>Areas of Figures:</b> Area of an irregular figure by Trapezoidal rule, average ordinate rule, Simpson's 1/3 rule, various coordinate methods; Planimeter - types of planimeter including digital planimeter. Computation of volume by trapezoidal and prismoidal formula, volume from spot levels.</p>

  
 Deah -Academic  
 H.P. Technical University  
 177 001. HP

**Course Learning Outcomes (CLOs):**

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

- Define Surveying and basic concepts of surveying.
- Use different method of surveying, Analyze and interpret survey data for computing area and volume
- Collect field data so a map or plan can be prepared basis on the calculations of the field parameters before an engineering operation is actually executed to begin a construction project.
- Apply different technic of surveying in field.
- Design different structure with the help of field data
- Predict the appropriate method for any survey project

**Textbooks:**

- N.N.Basak, -Surveying and Levelingll, 1<sup>st</sup> edition, Tata McGraw Hill.
- A Banniister, -S. Raymond and R Baker, —Surveyingll, seventh edition, Pearson.

**Reference Books:**

- Kanetkar and Kulkarni, —Surveying and Levelingll, Vol I & II, 24th edition, Pune VidyarthiGriha, Pune.
- R.Agor, —Surveyingll, Khanna Publishers.

**e-Learning Resources:**

- <https://archive.nptel.ac.in/courses/105/104/105104101>

  
Dean - Academic  
H.P. Technical University  
Hamirpur - 177 001, HP

HS-311 Engineering Economics							
Teaching Scheme			Credit	Marks Distribution			Duration of End Semester Examination
L	T	P		C	Internal Assessment	End Semester Examination	
2	0	0	2	Maximum Marks: 40	Maximum Marks: 60	100	3 Hours
				Minimum Marks: 16	Minimum Marks: 24	40	

**Instructions to the question paper setter:**

Question paper of end semester examination will be of 60 marks. The question paper will consist of five sections A, B, C, D and E. Sections A, B, C and D will have 2 questions of 12 marks each and section E has short answer type questions consisting of six parts of 02 marks each. The candidate will attempt five questions in all, i.e., one question each from sections A, B, C, D and the compulsory question from section E. In the question paper, the questions available in sections A, B, C and D will be covered from Unit-I, Unit-II, Unit-III and Unit-IV respectively and section-E will cover whole syllabus.

**Course Learning Objectives:**

- Understand the basic definitions, nature, scope, and significance of economics.
- Learn about the elasticity of demand, its types, methods of measurement, and its importance in economic analysis.
- Examine price determination under different market structures, including perfect competition, monopoly, monopolistic competition, and oligopoly.
- Explore the meaning, types, theories, causes, effects, and control measures of inflation.

Unit-I
<b>Introduction:</b> Definition, Nature, Scope, Importance and significance of Economics, Distinction between Microeconomics and Macroeconomics. Concept of Utility and Its Types. <b>Demand and Supply:</b> Meaning, Demand Function, Law of Demand. Elasticity of Demand, Types, Measurement and importance. Demand Forecasting and its techniques. Concept of Supply, Law of supply.
Unit-II
<b>Production Function:</b> Concept and types, Returns to Factor and Returns to Scale, Law of Variable Proportions. <b>Cost and Revenue:</b> Concept of Cost, Short run and Long-run Cost Curves, Relationships among various costs, Break-even Analysis. Revenue: Concept and its types.
Unit-III
<b>Market Structure:</b> Price Determination under Different Market Structure i.e. Perfect Competition, Monopoly, Monopolistic Competition Oligopoly. <b>Reserve Bank of India:</b> Nature, Organisation Structure, Objectives, Function of RBI. <b>Monetary Policy and Fiscal Policy:</b> Meaning, Objectives and Its tools and Techniques of Monetary and Fiscal Policy.
Unit-IV
<b>National Income:</b> Definition of National Income and its Aggregates, Methods of Calculating National Income. <b>Inflation:</b> Meaning, Types, Theories, Causes, Effects and Control. <b>Business Cycle</b> – Meaning- Phases of business cycle.

  
 Dean - Academic  
 H.P. Technical University  
 Hamirpur - 177 001, HP

### Course Learning Outcomes (CLOs):

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

- Identify the determinants of supply and demand; demonstrate the impact of shifts in both market supply and demand curves on equilibrium price and output.
- Determine the roles that prices and markets play in organizing and directing economic activity Calculate and graph the short-run and long-run costs of production, supply and demand elasticities. Describe governmental efforts to address market failure such as monopoly power, externalities, and public goods.
- Examine and interpret a nation's economic performance indicators such as economic growth, unemployment and inflation from a macroeconomic perspective.
- Articulate the mechanics and institutions of international trade and their impact on the macro economy.

### Textbooks:

1. Steven A. Greenlaw, David Shapiro, "**Principles of Economics**", 2nd Edition, Rice University OpenStax, 2020. ISBN-13: 978-1947172371.
2. Managerial Economics, 8/e, D N Dwivedi, Vikas Publishing.

### Reference Books:

1. N. Gregory Mankiw, "**Principles of Economics**", 8th Edition, Cengage Learning, 2016. ISBN-13: 978-0357038314.
2. Niall Kishtainy, "**The Economics Book: Big Ideas Simply Explained**", 1st Edition, DK Publishers, 2012. ISBN-13: 978-0756698270.

  
Dean - Academic  
H.P. Technical University  
Hamirpur - 177 001, HP

CE-312P Fluid Mechanics Laboratory							
Teaching Scheme			Credit	Marks Distribution			Duration of End Semester Examination
L	T	P		Internal Assessment	End Semester Examination	Total	
0	0	2	1	Maximum Marks: 30 Minimum Marks: 12	Maximum Marks: 20 Minimum Marks: 8	50 20	2 Hours

#### Course Objectives:

- To learn the fundamental concepts relevant to Fluid mechanics
- To provide exposure to a variety of established fluid mechanics testing procedures and techniques

Sr. No.	List of Experiments
1	Measurement of viscosity
2	Study of Pressure Measuring Devices
3	Stability of Floating Body
4	Hydrostatics Force on Flat Surfaces/Curved Surfaces
5	Verification of Bernoulli's Theorem
6	Venturimeter
7	Orifice meter
8	Impacts of jets
9	Flow Visualisation -Ideal Flow
10	Length of establishment of flow
11	Velocity distribution in pipes
12	Laminar Flow

*The students shall conduct 7-8 experiments during the semester*

#### Course Learning Outcomes (CLOs):

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

- Estimate the friction and measure the frictional losses in fluid flow.
- Analyze a variety of practical fluid-flow devices and utilize fluid mechanics principles in design
- Predict the coefficient of discharge for flow through pipes.
- Conduct experiments in pipe flows and interpreting
- Analyse data from model studies to prototype cases, as well as documenting them in engineering reports

#### Suggested References:

- Fluid Mechanics and Machinery, C.S.P.Ojha, R. Berndtsson and P. N. Chadramouli, Oxford University Press, 2010
- Hydraulics and Fluid Mechanics, P M Modi and S M Seth, Standard Book House
- Theory and Applications of Fluid Mechanics, K. Subramanya, Tata McGraw Hill
- Fluid Mechanics with Engineering Applications, R.L. Daugherty, J.B. Franzini and E.J. Finnemore, Mc Graw Hill

  
 Dean - Academic



CE-313P Civil Engineering Materials Laboratory							
Teaching Scheme			Credit	Marks Distribution			Duration of End Semester Examination
L	T	P		Internal Assessment	End Semester Examination	Total	
0	0	2	1	Maximum Marks: 30	Maximum Marks: 20	50	2 Hours
				Minimum Marks: 12	Minimum Marks: 8	20	

**Course Objectives:**

- To learn the fundamental concepts relevant to properties of Civil Engineering materials and their application.
- To provide exposure to a variety of established material testing procedures and techniques.

Sr. No.	List of Experiments
1	Tests on cement - Fineness, Normal consistency, setting time, soundness, compressive strength, specific gravity.
2	Test on bricks: Water absorption, efflorescence, compressive strength
3	Tests on aggregate: Grain size distribution, specific gravity, bulking of sand, fineness modulus, water absorption
4	Tests on concrete: Workability tests – Slump, Compaction factor, Vee-bee and Flow table test
5	Test on steel bars: Tensile strength test
6	Tests on plywood: Water resistance test

**Course Learning Outcomes (CLOs):**

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

- Learn the various test procedures carried out for a Civil Engineering materials
- Understanding of common measurement instruments, equipment, devices.
- Perform the various tests of the Civil Engineering materials
- Measure physical properties of common construction materials
- Draw inference from the observations

**Suggested References:**

- Various related recent standards of BIS, IRC, ASTM, RILEM, AASHTO, etc. corresponding to testing of materials used for Civil Engineering applications.

**e-Learning Resources:**

- <https://archive.nptel.ac.in/courses/105/102/105102088/>

  
 Dean - Academic  
 H.P. Technical University  
 Hamirpur - 177 001, HP

CE-314P Surveying and Geomatics Laboratory							
Teaching Scheme			Credit	Marks Distribution			Duration of End Semester Examination
L	T	P		Internal Assessment	End Semester Examination	Total	
0	0	2	1	Maximum Marks: 30 Minimum Marks: 12	Maximum Marks: 20 Minimum Marks: 8	50 20	2 Hours

**Course Objectives:**

- To learn the fundamental concepts of surveying use in Civil Engineering and their application
- To collect field data, prepare plan or map of the area surveyed, analyse and to calculate the field parameters for setting out operation of actual engineering works, set out field parameters at the site for further engineering works

Sr. No.	List of Experiments
1	Chain and tape measurement and Traversing and plotting of Details.
2	Compass Traversing and plotting of Details
3	Plane table Survey - Method of Radiation and intersection.
4	Plane table Survey - Solving Two Point and Three Point Problems
5	Plane table Survey – Traverse
6	Levelling with HI and rise and fall method
7	Levelling with Longitudinal and cross sectioning and Contour surveying.
8	Setting out of foundation plan for load bearing and framed structure with 3-4-5 method.
9	Theodolite: temporary adjustments, measurement of horizontal and vertical angles
10	Theodolite traversing.
11	Checking verticality of high-rise structures.
12	Study of Minor instruments: Planimeter, pantagraph, clinometer, hand levels, Quick setting level, CylonGhat Tracer, Sextent, etc

*The students shall conduct 7-8 experiments during the semester*

**Course Learning Outcomes (CLOs):**

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

- Provide knowledge of basic surveying instruments.
- Develop skill in using chain, compass, plane table, levelling and theodolite.
- Apply the knowledge of different instrument operation in civil engineering works.
- Formulation the setting out of foundation plan of building etc.

**Suggested Textbooks:**

- N.N.Basak, —Surveying and Leveling, 1st edition, Tata McGraw Hill.
- A Banniister, S. Raymond and R Baker, —Surveying, seventh edition, Pearson.

**Suggested References:**

- Kanetkar and Kulkarni, —Surveying and Leveling, Vol I & II, 24th edition, VidyarthiGriha, Pune.
- R.Agor, —Surveying, Khanna Publishers.

  
 Dean - Academic  
 H.P. Technical University  
 Hamirpur - 177 001, HP

CE-315P Computer Aided Civil Engineering Drawing Laboratory							
Teaching Scheme			Credit	Marks Distribution			Duration of End Semester Examination
L	T	P		Internal Assessment	End Semester Examination	Total	
0	0	2	1	Maximum Marks: 30	Maximum Marks: 20	50	2 Hours
				Minimum Marks: 12	Minimum Marks: 8	20	

#### Course Objectives:

- Understand the principles and benefits of CAD for civil engineering applications.
- Become proficient in using CAD software for 2D drafting tasks.
- Learn essential drawing techniques for civil engineering projects, including plans, sections, elevations, and details.
- Apply dimensioning, annotation, and layering techniques to create professional drawings.
- Gain experience in creating basic 3D models of civil engineering structures

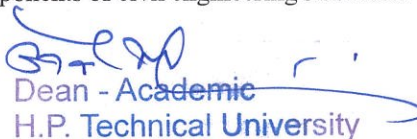
Sr. No.	List of Exercises
1	Learn interface and tools of CAD software
2	Practice simple mechanical drawings using tools/commands of CAD software
3	Preparation of detailed construction plan of residential building: front elevation, side elevation, floorplan, detailed sectional view, site plan, foundation plan
4	Preparation of line plans of <i>any one</i> public buildings like: <ul style="list-style-type: none"> <li>• Building for Education – School, College, Library</li> <li>• Building for health –Dispensary, Hospital Industrial structure</li> <li>• Building for entertainment-Theatre, Club House, Sports Club</li> <li>• Other Structure- Office, Hostel, Guest house</li> </ul>
5	Draft details of parts of <i>any one</i> door and window of the following: <ul style="list-style-type: none"> <li>• Door: Fully Paneled Door, Paneled and glazed door</li> <li>• Window: Paneled and glazed window, fully glazed window with sash bars</li> </ul>
6	Draft details of parts of steel roof truss
7	Draft details of parts of <i>any one</i> of the following stairs: <ul style="list-style-type: none"> <li>• Straight run stairs</li> <li>• Dog legged stairs</li> </ul>
8	Prepare layout showing <i>any one</i> building services like water supply and drainage, electrical fittings, firefighting
9	Prepare site plan for a building project, including property lines, existing structures, and proposed development
10	Creating 3D models of simple building components

*The students shall conduct 7-8 exercises during the semester*

#### Course Learning Outcomes (CLOs):

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

- Apply the concepts of engineering drawing and recognize the annotations and symbols of software
- Realize the function of basic tools used in AutoCAD and significance of AutoCAD as a drafting tool for civil engineering
- Choose the appropriate tools/commands for drafting any drawing or part of drawing
- Prepare detailed engineering drawings for components of civil engineering structures

  
 Dean - Academic  
 H.P. Technical University

- Apply basic CAD commands to develop different views of buildings, layout plans, site plans, buildingservices etc.
- Understand and visualize the 3-D view of a structure component

**Suggested References:**

- Bureau of Indian Standards," Hand Book of Functional Requirements of Buildings, (SP-41 & SP-32)", BIS 1987 and 1989, (SP-41: ISBN: 8170610117)
- Handbook of Water supply & drainage-BIS, (SP- 35: ISBN: 8170610095)
- N.B.C.-2016, Volume 1 & 2, BIS, (ISBN: 8170610990)
- M. Chakraborti (2017), Civil Engineering Drawing Including Architectural Aspects, UBS publication

  
Dean - Academic  
H.P. Technical University  
Hamirpur - 177 001, HP

## B.Tech (SEMESTER –III)

### Probability Statistical and Numerical Techniques (MAFC-311)

Time Allowed: 03 (Three hours)

Max. Marks: 60

**Note:** Candidates are required to attempt five questions in all selecting one question from each of the sections A, B, C & D of the question paper and all the subparts of the questions in section E. Use of statistical tables and non-programmable calculator is allowed.

#### Section-A

1. (a) A problem in statistics is given to two students A and B the odds in favour of A solving the problem are 6 to 9 and against B solving the problem are 12 to 10. If both A and B attempt find the probability of the problem being solved. (6)

- (b) If  $x$  and  $y$  are two independent random variables having joint density function:

$$f(x, y) = \begin{cases} \frac{1}{8}(6 - x - y); & 0 \leq x < 2, 2 \leq y < 4 \\ 0, & \text{Otherwise} \end{cases}$$

Find (i)  $P(x < 1 \cap y < 3)$  (ii)  $P(x + y < 3)$  (iii)  $P(x < 1 | y < 3)$ . (6)

2. (a) If 5% of the electric bulbs manufactured by a company are defective, use Poisson distribution to find the probability that in a sample of 100 bulbs (i) none is defective (ii) 5 bulbs will be defective. (6)

- (b) In a distribution exactly normal 7% of the items are under 35 and 89% are under 63. What are the mean and standard deviation of the distribution? (Use normal table) (6)

#### Section-B

3. (a) A coin was tossed 400 Times and the head turned up 216 times. Test the hypothesis that the coin is unbiased at 5% level of significance. (6)

- (b) The mean of two single large samples of 1000 and 2000 members are 67.5 inches and 68.0 inches respectively. Can the sample be regarded as drawn from the same population of standard deviation 2.5 inches? (Test at 5% level of significance). (6)

4. (a) A drug is given to 10 patients, and the increments in their blood pressure were recorded to be 3, 6, -2, 4, -3, 4, 6, 0, 0, 2. Is it reasonable to believe that the drug has no side effect on change of blood pressure? (6)

- (b) In one sample of 8 observations, the sum of the squares of deviations of the sample values from the sample mean was 84.4 and in the other sample of 10 observations it was 102.6. Test whether this difference is significant at 5 per cent level using F- test. (6)



Dean - Academic  
H.P. Technical University  
Hamirpur - 177 001, HP

(6)

### Section-C

5. (a) Using, Newton's Raphson method, find the real root of the equation  $3x = \cos x + 1$ . Also, evaluate the value of  $\sqrt{5}$  by using Newton's method. (6)

(b) Solve the system of equations

$$\begin{aligned} 10x - 7y + 3z + 5u &= 6, \\ -6x + 8y - z - 4u &= 5, \\ 3x + y + 4z + 11u &= 2, \\ 5x - 9y - 2z + 4u &= 7 \end{aligned}$$

by using Gauss elimination method. (6)

6. (a) Find the polynomial  $f(x)$  by using Lagrange's formula and hence find  $f(3)$  for the given data:

$x$	0	1	2	5
$f(x)$	2	3	12	147

(6)

(b) Find the missing term by using Newton's divided difference formula

$x$	0	1	2	3	4
$y$	1	3	9	...	81

(6)

### Section-D

7. (a) Evaluate  $\int_0^1 \frac{1}{1+x^2}$  by using Simpson's  $\frac{1}{3}$ rd rule, taking  $h = 1/4$  and by Simpson's  $\frac{3}{8}$ th rule, taking  $h = 1/6$ . (6)

(b) Evaluate  $\int_0^6 x \sec x \, dx$  using six intervals by Trapezoidal rule.

(6)

8. (a) Using Taylor series method of order four to solve the initial value problem  $y' = (x - y)/2$ , on  $[0, 3]$  with  $y(0) = 1$ . Compare solutions for  $h = 1, \frac{1}{2}, \frac{1}{4}$  and  $\frac{1}{8}$ . (6)

(b) Consider an ordinary differential equation  $\frac{dy}{dx} = x^2 + y^2$ ,  $y(1) = 1.2$ . Find  $y(1.05)$  using the fourth order Runge-Kutta method. (6)

  
 Dean - Academic  
 H.P. Technical University  
 Hamirpur - 177 001, HP

### Section-E

9. (i) State Bayes theorem for probability.  
(ii) Write the importance of Normal distribution.  
(iii) A card is drawn from a well shuffled pack of cards. What is the probability that it is a heart or a queen?  
(iv) Differentiate between null and alternate hypothesis?  
(v) Define F- distribution.  
(vi) Write Newton iterative formula to find the value of  $\sqrt[3]{N}$ .  
(vii) **What is nth difference of a polynomials of degree n.**  
(viii) Out of Regula-Falsi and Newton –Raphson method whose rate of convergence is faster and why?  
(ix) How Gauss Quadrature formula for two point and three point scale varies?  
(x) Find the value of  $E^{-1}\nabla$ .  
(xi) Define discrete distribution?  
(xii) Explain the term Covariance.

(12 × 1 = 12)

  
Dean - Academic  
H.P. Technical University  
Hamirpur - 177 001, HP

