B.Tech (Civil Engineering)

SEMESTER –III

Sl No.	Course Code	Course Title	Hours Per Week			Total Credits	ESE	IA
			Lecture	Tutorial	Practical			
1.	101301	Solid Mechanics	3	0	0	3	70	30
2.	101302	Engineering Mathematics-III	3	1	0	4	70	30
3.	101303	Universal Human Values	3	0	0	3	70	30
4.	101304	Surveying and Geomatics	3	0	0	3	70	30
5.	101305	Fluid Mechanics	3	0	0	3	70	30
6.	101306	Materials, Testing & Evaluation	3	0	0	3	70	30
7.	101307	Indian Knowledge System	3	0	0	0	-	-
8.	101301P	Solid Mechanics Lab	0	0	2	1	30	20
9.	101304P	Surveying and Geomatics Lab	0	0	2	1	30	20
10.	101305P	Fluid Mechanics Lab	0	0	2	1	30	20
11.	101306P	Materials Testing & Evaluation Lab	0	0	2	1	30	20
12.	101308	Internship-I	2 Weeks			2	30	20
					TOTAL	25	850	

Semester-III

Course Code-101301 Solid Mechanics 3 0 0 3

Unit- 1.0 Simple Stresses and Strains 8 hrs

Concept of stress and strain, St. Venant's principle, stress and strain diagram, Elasticity and plasticity – Types of stresses and strains, Hooke's law – stress – strain diagram for mild steel – Working stress – Factor of safety – Lateral strain, Poisson's ratio and volumetric strain – Elastic moduli and the relationship between them – Bars of varying section – composite bars – Temperature stresses. Strain Energy – Resilience – Gradual, sudden, impact and shock loadings – simple applications.

Unit- 2.0 Compound Stresses and Strains 5 hrs

Two dimensional system, stress at a point on a plane, principal stresses and principal planes, Mohr circle of stress, ellipse of stress and their applications. Two dimensional stress-strain system, principal strains and principal axis of strain, circle of strain and ellipse of strain. Relationship between elastic constants.

Unit- 3.0 Bending moment and Shear Force Diagrams 6 hrs

Bending moment (BM) and shear force (SF) diagrams.BM and SF diagrams for cantilevers simply supported and fixed beams with or without overhangs. Calculation of maximum BM and SF and the point of contra flexure under concentrated loads, uniformly distributed loads over the whole span or part of span, combination of concentrated loads (two or three) and uniformly distributed loads, uniformly varying loads, application of moments.

Unit- 4.0 Flexural Stresses 8 hrs

Theory of simple bending – Assumptions – Derivation of bending equation: $M/I = f/y = E/R$ - Neutral axis – Determination of bending stresses – Section modulus of rectangular and circular sections (Solid and Hollow), I,T, Angle and Channel sections – Design of simple beam sections.

Unit- 5.0 5 hrs

Shear Stresses- Derivation of formula – Shear stress distribution across various beam sections like rectangular, circular, triangular, I, T angle sections. Slope and deflection- Relationship between moment, slope and deflection, Moment area method, Macaulay's method. Use of these methods to calculate slope and deflection for determinant beams.

Unit- 6.0 10 hrs

Torsion- Derivation of torsion equation and its assumptions. Applications of the equation of the hollow and solid circular shafts, torsional rigidity, Combined torsion and bending of circular shafts, principal stress and maximum shear stresses under combined loading of bending and torsion. Analysis of close-coiled-helical springs. Thin Cylinders and Spheres- Derivation of formulae and calculations of hoop stress, longitudinal stress in a cylinder, and sphere subjected to internal pressures.

Text/ Reference:-

1. Timoshenko, S. and Young, D. H., "Elements of Strength of Materials", DVNC, New York, USA.
2. Kazmi, S. M. A., "Solid Mechanics" TMH, Delhi, India.
3. Hibbeler, R. C. Mechanics of Materials. 6th ed. East Rutherford, NJ: Pearson Prentice Hall, 2004
4. Crandall, S. H., N. C. Dahl, and T. J. Lardner. An Introduction to the Mechanics of Solids. 2nd ed. New York, NY: McGraw Hill, 1979
5. Laboratory Manual of Testing Materials - William Kendrick Hall

6. Mechanics of Materials - Ferdinand P. Beer, E. Russel Jhonston Jr., John T. DEwolf – TMH 2002.
7. Strength of Materials by R. Subramanian, Oxford University Press, New Delhi.

Course Code-101302 Engineering Mathematics-III (PDE, Prob/stat) 3 1 0 4

Unit 1.0 **7 hrs**

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 2.0 **8 hrs**

Second-order linear equations and their classification, Initial and boundary conditions, D'Alembert's solution of the wave equation; Duhamel's principle for one dimensional wave equation. Heat diffusion and vibration problems, Separation of variables method to simple problems in Cartesian coordinates. The Laplacian in plane, cylindrical and spherical polar coordinates, solutions with Bessel functions and Legendre functions. One dimensional diffusion equation and its solution by separation of variables.

Unit 3.0 **8 hrs**

Probability spaces, conditional probability, independence; Discrete random variables, Independent random variables, the multinomial distribution, Poisson approximation to the binomial distribution, infinite sequences of Bernoulli trials, sums of independent random variables; Expectation of Discrete Random Variables, Moments, Variance of a sum, Correlation coefficient, Chebyshev's Inequality.

Unit 4.0 **5 hrs**

Continuous random variables and their properties, distribution functions and densities, normal, exponential and gamma densities.Bivariate distributions and their properties, distribution of sums and quotients, conditional densities, Bayes' rule.

Unit 5.0 - **7 hrs**

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 6.0- **7 hrs**

Test of significance: Large sample test for single proportion, difference of proportions, 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.

Text/ Reference:-

1. Erwin Kreyszig, Advanced Engineering Mathematics, 9thEdition, John Wiley & Sons, 2006.
2. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications.
3. P. G. Hoel, S. C. Port and C. J. Stone, Introduction to Probability Theory, Universal Book Stall.
4. S. Ross, A First Course in Probability, 6th Ed., Pearson Education India,2002.

Course Code-101303 Universal Human Values 3 0 0 3

Unit- 1.0: 7 hrs

Introduction to Value Education:

Right Understanding, Relationship and Physical Facility (Holistic Development and the Role of Education), Understanding Value Education Sharing about Oneself, Self-exploration as the Process for Value Education, Continuous Happiness and Prosperity – the Basic Human Aspirations, Exploring Human Consciousness, Happiness and Prosperity – Current Scenario, Method to Fulfill the Basic Human Aspirations,

Unit- 2.0: 7hrs

Harmony in the Human Being:

Understanding Human being as the Co-existence of the Self and the Body, Distinguishing between the Needs of the Self and the Body, The Body as an Instrument of the Self, Understanding Harmony in the Self, Harmony of the Self with the Body, Programme to ensure self-regulation and Health.

Unit- 3.0: 7 hrs

Harmony in the Family and Society:

Harmony in the Family – the Basic Unit of Human Interaction, 'Trust' – the Foundational Value in Relationship, 'Respect' – as the Right Evaluation, Other Feelings, Justice in Human-to-Human Relationship, Understanding Harmony in the Society, Vision for the Universal Human Order.

Unit- 4.0: 7 hrs

Harmony in the Nature/Existence

Understanding Harmony in the Nature, Interconnectedness, self-regulation and Mutual Fulfilment among the Four Orders of Nature, Realizing Existence as Co-existence at All Levels, The Holistic Perception of Harmony in Existence.

Unit- 5.0: 7 hrs

Implications of the Holistic Understanding – a Look at Professional

Natural Acceptance of Human Values, Definitiveness of (Ethical) Human Conduct, A Basis for Humanistic Education, Humanistic Constitution and Universal Human Order,

Competence in Professional Ethics, Holistic Technologies, Production Systems and Management Models-Typical Case Studies, Strategies for Transition towards Value-based Life and Profession .

Unit- 6.0: 7 hrs

Competence in Professional Ethics, Holistic Technologies, Production Systems and Management Models-Typical Case Studies, Strategies for Transition towards Value-based Life and Profession.

Text /Reference:

1. A Foundation Course in Human Values and Professional Ethics, R R Gaur, R Asthana, G P Bagaria, 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-8703447.
2. JeevanVidya: EkParichaya, A Nagaraj, JeevanVidyaPrakashan, Amarkantak, 1999.
3. Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004.
4. The Story of Stuff (Book).
5. The Story of My Experiments with Truth – by Mohandas Karamchand Gandhi.
6. Small is Beautiful – E. F Schumacher.
7. Slow is Beautiful – Cecile Andrews.
8. Economy of Permanence – J C Kumarappa.
9. Bharat Mein Angreji Raj – Pandit Sunderlal.

10. Rediscovering India – by Dharampal.
11. Hind Swaraj or Indian Home Rule – by Mohandas K. Gandhi.
12. India Wins Freedom – Maulana Abdul Kalam Azad.
13. Vivekananda – Romain Rolland (English)
14. Gandhi – Romain Rolland (English)

Course Code-101304 Surveying and Geomatics 3 0 0 3

Unit- 1.0 **4 hrs**

Introduction to Surveying: Principles, Linear, angular and graphical methods, Survey stations, Survey lines- ranging, Bearing of survey lines, Levelling: Plane table surveying, Principles of levelling- booking and reducing levels; differential, reciprocal leveling, profile levelling and cross sectioning. Digital and Auto Level, Errors in levelling; contouring: Characteristics, methods, uses; areas and volumes.

Unit- 2.0 **5 hrs**

Triangulation and Trilateration: Theodolite survey: Instruments, Measurement of horizontal and vertical angle; Horizontal and vertical control - methods -triangulation network- Signals. Baseline - choices - instruments and accessories - extension of base lines corrections - Satellite station - reduction to centre - Intervisibility of height and distances - Trigonometric leveling - Axis single corrections.

Unit- 3.0 Curves **3 hrs**

Elements of simple and compound curves – Method of setting out– Elements of Reverse curve - Transition curve – length of curve – Elements of transition curve - Vertical curves.

Unit- 4.0 **6 hrs**

Modern Field Survey Systems:Principle of Electronic Distance Measurement, Modulation, Types of EDM instruments, Distomat, Total Station – Parts of a Total Station – Accessories – Advantages and Applications, Field Procedure for total station survey, Errors in Total Station Survey; Global Positioning Systems- Segments, GPS measurements, errors and biases, Surveying with GPS, Co-ordinate transformation, accuracy considerations.

Unit- 5.0 **6 hrs**

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

Unit- 6.0 **4 hrs**

Remote Sensing: Introduction –Electromagnetic Spectrum, interaction of electromagnetic radiation with the atmosphere and earth surface, remote sensing data acquisition: platforms and sensors; visual image interpretation; digital image processing.

Text/ Reference:-

1. Madhu, N, Sathikumar, R and Satheesh Gobi, Advanced Surveying: Total Station, GIS and Remote Sensing, Pearson India, 2006.
2. Manoj, K. Arora and Badjatia, Geomatics Engineering, Nem Chand & Bros, 2011
3. Bhavikatti, S.S., Surveying and Levelling, Vol. I and II, I.K. International, 2010
4. Chandra, A.M., Higher Surveying, Third Edition, New Age International (P) Limited, 2002.
5. Anji Reddy, M., Remote sensing and Geographical information system, B.S. Publications, 2001.
6. Arora, K.R., Surveying, Vol-I, II and III, Standard Book House, 2015.

Course Code-101305 Fluid Mechanics 3 0 0 3

Unit- 1.0: Basic Concepts and Definitions 7 hrs

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- 2.0 Fluid Statics - Fluid Pressure: 7 hrs

Pressure at a point, Pascals 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. Buoyancy and stability of floating bodies.

Unit- 3.0: Fluid Kinematics- Classification of fluid flow : 7 hrs

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

Unit- 4.0 Fluid Dynamics 7 hrs

Surface and body forces; Equations of motion - Euler's equation; Bernoulli's equation – derivation; Energy Principle; Practical applications of Bernoulli's equation : venturimeter, orifice meter and pitot tube; Momentum principle; Forces exerted by fluid flow on pipe bend; Vortex Flow – Free and Forced; Dimensional Analysis and Dynamic Similitude - Definitions of Reynolds Number, Froude Number, Mach Number, Weber Number and Euler Number; Buck ingham's π-Theorem.

Unit- 5.0 Laminar Flow 7 hrs

Laminar flow through :circular pipes, annulus and parallel plates. Stoke's law, Measurement of viscosity, Flow through Pipes:Loss of head through pipes,Darcy-Wiesbatch equation, minor losses, total energy equation, hydraulic gradient line,Pipes in series, equivalent pipes, pipes in parallel, flow through laterals, flows in dead end pipes, siphon, power transmission through pipes, nozzles. Analysis of pipe networks: Hardy Cross method, water hammer in pipes and control measures, branching of pipes, three reservoir problem.

Unit- 6.0 Dimensional Analysis and Hydraulic Similitude 7 hrs

Dimensional homogeneity, Rayleigh method, Buckingham's Pi method and other methods. Dimensionless groups. Similitude, Model studies, Types of models. Application of dimensional analysis and model Studies to fluid flow problem. Dynamic Similitude-Definitions of ReynoldsNumber, Froude Number, MachNumber, Weber Number and EulerNumber. Turbulent Flow- Reynolds experiment, Transition from laminar to turbulent flow. Definition of turbulence, scale and intensity, Causes of turbulence, instability, mechanism of turbulence and effect of turbulent flow in pipes. Reynolds stresses, semi-empirical theories of turbulence, Prandtl's mixing length theory, universal velocity distribution equation. Resistance to flow of fluid in smooth and rough pipes, Moody's diagram.

Text/ Reference:-

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

B.Tech (Civil Engineering) **(SESSION 2024 onwards)**

Course Code- 101306 Materials, Testing & Evaluation 3 0 0 3

Unit- 1.0 **7 hrs**

Introduction to Engineering Materials covering, Cements, M-Sand, Concrete (plain, reinforced and steel fibre/ glass fibre-reinforced, light-weight concrete, High Performance Concrete, Polymer Concrete) Ceramics, and Refractories, Bitumen and asphaltic materials, Timbers, Glass and Plastics, Structural Steel and other Metals.

Unit- 2.0 **6 hrs**

Paints and Varnishes, Acoustical material and geo-textiles, rubber and asbestos, laminates and adhesives, Graphene, Carbon composites and other engineering materials including properties and uses of these.

Unit- 3.0 **8 hrs**

Introduction to Material Testing covering, What is the " Material Engineering" ?; Mechanical behavior and mechanical characteristics; Elasticity – principle and characteristics; Plastic deformation of metals; Tensile test – standards for different material (brittle, quasi-brittle, elastic and so on) True stress – strain interpretation of tensile test.

Unit- 4.0 **9 hrs**

Hardness tests; Bending and torsion test; strength of ceramic; Internal friction, creep – fundaments and characteristics; Brittle fracture of steel – temperature transition approach; Background of fracture mechanics; Discussion of fracture toughness testing – different materials; concept of fatigue of materials; Structural integrity assessment procedure and fracture mechanics.

Unit- 5.0 **7 hrs**

Standard Testing & Evaluation Procedures covering, Laboratory for mechanical testing; Discussion about mechanical testing; Naming systems for various irons, steels and nonferrous metals; Discussion about elastic deformation; Plastic deformation; Impact test and transition temperatures.

Unit- 6.0 **5 hrs**

Fracture mechanics – background; Fracture toughness – different materials; Fatigue of material; Creep.

Text/ Reference:-

1. Chudley, R., Greeno (2006), 'Building Construction Handbook' (6th ed.),R. Butterworth- Heinemann.
2. Khanna, S.K., Justo, C.E.G and Veeraragavan, A, ' Highway Materials and Pavement Testing', Nem Chand& Bros, Fifth Edition.
3. Various related updated & recent standards of BIS, IRC, ASTM, RILEM, AASHTO, etc. corresponding to materialsused for Civil Engineering applications.
1. Kyriakos Komvopoulos (2011), Mechanical Testing of Engineering Materials, Cognella.
5. E.N. Dowling (1993), Mechanical Behaviour of Materials,Prentice Hall International Edition
2. American Society for Testing and Materials (ASTM), Annual Book of ASTM Standards (post 2000).
7. Related papers published in international journals.

Course Code- 101307 Indian Knowledge System 3 0 0 0

Unit-1.0 **7 hrs**

Introduction to Indian Knowledge Systems

Overview of IKS, Organization of IKS , Conception and constitution of knowledge in indian tradition, The oral tradition, Models and Strategies of IKS.

Unit-2.0 **5 hrs**

Overview of IKS Domains

The vedasas the basis of IKS, Overview of all the six vedāṅgas.

Unit-3.0 **8 hrs**

Relevance in Current Technical Education System I

Relevance of following IKS domains in present technical education system: Arthashastra (Indian economics and political systems), Ganitaand Jyamiti(indianmathematics, astronomy and geometry, Rasayana (indianchemical Sciences).

Unit-4.0 **8 hrs**

Relevance in Current Technical Education System II

Ayurveda (Indian Biological Sciences / Diet & Nutrition), JyotishVidya (observational astronomy and calendar systems), PrakritiVidya(indian system of terrestrial/ material sciences/ecology and atmospheric sciences).

Unit-5.0 **7 hrs**

Relevance in Current Technical Education System III

VastuVidya(indian system of aesthetics-iconography and built-environment /architecture), NyayaShastra(indian systems of social ethics, logic and law).

Unit-6.0 **7 hrs**

Shilpa andNatyaShastra (indian classical arts: performing and fine arts), Sankhyaand Yoga Darshna(indian psychology, yoga and consciousness studies), Vrikshayurveda(plant science/sustainable agriculture/food preservation methods).

Text/Reference:-

1. Introduction to Indian Knowledge System: Concepts and Applications, Archak, K.B. (2012)., Kaveri Books, New Delhi, ISBN-13:978-9391818203
2. Introduction To Indian Knowledge System: Concepts and Applications, Mahadevan, B. Bhat, VinayakRajat, NagendraPavana R.N., PHI, ISBN: 9789391818203.
3. Glimpse into Kautilya's Arthashastra Ramachandrudu P. (2010) , Sanskrit Academy, Hyderabad, ISBN:9788380171074.
4. "Introduction" in Studies in Epics and Purāṇas, (Eds.), KM Munshi and N ChandrashekaraAiyer BhartiyaVidyaBhavan.

Course Code- 101301P Solid Mechanics Lab 0 0 2 1

Perform any 10 Experiments

List of Experiments:

1. Tension test
2. Bending tests on simply supported beam and Cantilever beam.
3. Compression test on concrete
4. Impact test
5. Shear test
6. Investigation of Hook's law that is the proportional relation between force and stretching in elastic deformation
7. Determination of torsion and deflection
8. Measurement of forces on supports in statically determinate beam
9. Determination of shear forces in beams
10. Determination of bending moments in beams
11. Measurement of deflections in statically determinate beam
12. Measurement of strain in a bar
13. Bend test steel bar
14. Yield/tensile strength of steel bar

Course Code- 101304P Surveying and Geomatics Lab 0 0 2 1
Perform any 10 Experiments

List of Experiments:

EXPERIMENT NO. 1
Problem I: Measurement of distance by ranging and chaining
Problem II: Determination of the area - Closed Traverse
Problem III: Distance between two points across a sloping ground
EXPERIMENT NO. 2.
Problem I: Compass Survey: Distance between two inaccessible points
Problem II. Compass Survey: Closed traverse
EXPERIMENT NO. 3 - Plane Table Survey I: Radiation method and intersection method.
EXPERIMENT NO. 4 - Plane Table Survey II: Two-point and three-point problems.
EXPERIMENT NO. 5 - Plane Table Survey III: Traversing
EXPERIMENT NO. 6 - Levelling I: Differential levelling
EXPERIMENT NO. 7 - Levelling II: Longitudinal and cross-sectioning leveling.
EXPERIMENT NO. 8 - Contouring
EXPERIMENT NO. 9 - Theodolite Traversing: Measurements of horizontal angles by repetition method
EXPERIMENT NO. 10 - Theodolite Traversing: Determination of elevation of an object
EXPERIMENT NO. 11 - Tachometry: Determination of heights and distances by Tangential Tacheometry.
EXPERIMENT NO. 12 - Total Station: Determination of distance and difference in elevation between two inaccessible points

Course Code- 101305P Fluid Mechanics Lab 0 0 2 1

Perform any 10 Experiments

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.

Course Code- 101306P **Materials, Testing & Evaluation Lab** **0 0 2 1**

Perform any 10 Experiments

List of Experiments:

1. Gradation of coarse and fine aggregates
2. Different corresponding tests and need/application of these tests in design and quality control
3. Tensile Strength of materials & concrete composites
4. Compressive strength test on aggregates
5. Tension I - Elastic Behaviour of metals & materials
6. Tension II - Failure of Common Materials
7. Concrete I - Early Age Properties
8. Concrete II - Compression and Indirect Tension
9. Compression – Directionality
10. Consolidation and Strength Tests
11. Tension III - Heat Treatment
12. Torsion test
13. Hardness tests (Brinnel's and Rockwell)
14. Tests on closely coiled and open coiled springs
15. Theories of Failure and Corroboration with Experiments
16. Concrete Mix Design as per BIS

Course Code- 101308 Internship – I 02 Weeks (2 Credits)

Internship I Guidelines:

Internship I is of a minimum duration of two weeks which can be completed in an Industry/Institute in consultation with concerned Engineering College/ Institute. After completion of internship a detailed report of the internship mentioning the training undertaken along with certificate should be submitted.