

## Undergraduate Degree Courses in Engineering & Technology

### BACHELOR OF ENGINEERING (CIVIL ENGINEERING)

#### General, Course structure & Theme & Semester-wise credit distribution

#### A. Definition of Credit:

1 Hr. Lecture (L) per week	1 credit
1 Hr. Tutorial (T) per week	1 credit
1 Hr. Practical (P) per week	0.5 credits
2 Hours Practical (Lab)/week	1 credit

#### B. Structure of Undergraduate Engineering program:

S. No.	Category	Suggested Breakup of Credits (Total 160)
1.	Basic Science Courses (BSC)	20
2.	Engineering Science Courses (ESC)	30
3.	Humanities, Social Science and Management Courses (HSMC)	10
4.	Professional Core Courses (PCC)	60
5.	Professional Elective Courses (PEC)	18
6.	Open Elective Courses (OEC)	14
7.	Seminar	2
8.	Project	10
9.	Internships in industry	8
10.	Mandatory Courses (MC)	NC
	Total Credits	172

#### C. Course code and definition:

Course code	Definitions
BSC	Basic Science Courses
ESC	Engineering Science Courses
HSMC	Humanities and Social Sciences including Management courses
PCC	Professional core courses
PEC	Professional Elective courses
OEC	Open Elective courses
LC	Laboratory course
MC	Mandatory courses

*\*Minor variation is allowed as per need of the respective disciplines.*

**B.E II Year (Semester-III) Civil Engineering  
Course Structure & Evaluation Scheme**

S No.	Course Category	Course Code	Course Title	Periods/ Week			Sessional Marks			End Semester Marks			Credit
				L	T	P	CT	TA	Total	TE	PE	Total	
1	BSC	BSC 301	Mathematics -III	3	1	-	30	10	40	60	-	100	4
2	ESC	ESC 301	Strength of Material	3	1	-	30	10	40	60	-	100	4
3	ESC	ESC 302	Building Material & Construction	3	1	-	30	10	40	60	-	100	4
4	PCC	BCE 301	Surveying	3	1	-	30	10	40	60	-	100	4
5	PCC	BCE 302	Water Resources Engineering	3	0	0	30	10	40	60	-	100	3
6	MC	MC 301	Environment & Ecology	2	0	0	30	10	40	60	-	100	0
7	ESC	ESC 351	Building Material & Construction Lab	-	-	2	20	20	40	-	60	100	1
8	PCC	BCE 352	Surveying Lab	-	-	2	20	20	40	-	60	100	1
9	Project/Internship	BCE 353	Mini Project/Internship	-	-	4	-	-	100	-	-	100	2
			<b>Total</b>	<b>17</b>	<b>5</b>	<b>8</b>	<b>220</b>	<b>100</b>	<b>420</b>	<b>360</b>	<b>120</b>	<b>900</b>	<b>23</b>

\* The mini project or Internship (3-4 weeks) conducted during summer break after II semester & will be assessed during III semester.

CT: Class Test, TA: Teacher's Assessment, TE: Theory Exam, PE: Practical Exam

**Dean (Academics)**

**Director**

**B.E II Year (Semester-IV) Civil Engineering  
Course Structure & Evaluation Scheme**

S No.	Course Category	Course Code	Course Title	Periods/Week			Sessional Marks			End Semester Marks			Credit
				L	T	P	CT	TA	Total	TE	PE	Total	
1	PCC	BCE 401	Fluid Mechanics	3	1	-	30	10	40	60	-	100	4
2	HSMC	HSMC 401	Disaster Management	2	0	-	30	10	40	60	-	100	2
3	PCC	BCE 402	Structural Analysis-I	3	1	-	30	10	40	60	-	100	4
4	PCC	BCE 403	Estimating & Costing	2	2	-	30	10	40	60	-	100	4
5	PCC	BCE 404	Geotech Engineering	3	-	-	30	10	40	60	-	100	3
6	HSMC	HSMC 402	Technical writing and communication	2	-	-	30	10	40	60	-	100	2
7	MC	MC 401	Human Value and Professional Ethics	3	-	-	30	10	40	60	-	100	0
8	PCC	BCE 451	Fluid Mechanics Lab	-	-	2	20	20	40	-	60	100	1
9	PCC	BCE 454	Geotech Engineering Lab	-	-	2	20	20	40	-	60	100	1
			<b>Total</b>	<b>18</b>	<b>4</b>	<b>4</b>	<b>250</b>	<b>110</b>	<b>360</b>	<b>360</b>	<b>120</b>	<b>900</b>	<b>21</b>

Dean(Academics)

Director

**MATHEMATICS-III**  
**COURSE CODE: BSC-301**  
**III SEMESTER (ECE, CSE, EE, ME, CE)**

**L T P C**  
**3 1 0 4**

**Course Details:**

**Unit – I:**

**Fourier Transform :**

Fourier integral, conditions of convergence, Fourier sine and cosine integrals, complex form, applications, Inversion formula for Fourier transform, operational properties. Discrete and Fast Fourier transform. Applications of Fourier transform to solve boundary value problems.

**Unit- II:**

**Functions of a Complex Variable and Conformal mapping:**

Limit, Continuity, Differentiability and Analyticity of functions of a complex variable, Cauchy-Riemann equations, Harmonic functions, Complex functions as mappings, Linear Transformation, Inverse transformation, Bilinear Transformations, Conformal Mapping & applications.

**Unit- III:**

**Integration of Complex Functions:**

Contour integrals and evaluations, Cauchy's Theorem, Cauchy's Integral Formulae, Liouville's theorem, Convergence of power series, Taylor series, Laurent series, Zeros and Singularities of a complex function, Residues and Residue theorem, Evaluation of definite and improper integrals.

**Unit- IV:**

**Curve- Fitting & Probability:**

Curve-fitting: method of least- squares, Normal equations, Normal equation in case of straight line, Fitting a straight line, Polynomial, non-linear and exponential curves, Change of origin. Probability: Basics of probability, random variables, Expectation, Baye's theorem and probability distributions, Binomial, Poisson and Normal distributions.

**Unit- V:**

**Statistical Methods:**

Sampling Theory, Parameters of Statistics, Tests of hypothesis and significance, z-test, t-test,  $\chi^2$ - test, Goodness of fit test, Time series analysis, Index numbers, Quality control chart and acceptance sampling, Introduction to design of experiments, Forecasting models.

**Books Recommended:**

1. R.K. Jain & S.R.K. Iyengar; Advanced Engineering Mathematics, Narosa Publishing House, 2002.
2. Erwin Kreyszig; Advanced Engineering Mathematics, John Wiley & Sons, 1962.
3. R.V. Churchill and J.L. Brown, Complex Variables and Applications, McGraw Hill, 1990.
4. B.S.Grewal, Higher Engineering Mathematics, Khanna Publisher, 2005.
5. J.H. Mathews and R.W. Howell, Complex analysis for Mathematics and Engineering, 3rd Ed. Narosa, 1998.

**Course Objective :**

1. Fourier transform is useful in study of frequency response of filter, In the theories of communication engineering, wave propagation, transmission lines and solution of boundary value problems. Discrete and fast fourier transform are used in signal analysis. Fourier transform is also used in electromagnetic field, medical application and in error control coding. Discrete analysis plays an important role in the development of communication engineering.
2. Complex Analysis is the study of analytic functions. It is an elegant and powerful method useful in the study of heat flow, fluid dynamics and electrostatics. Two-dimensional potential problem can be solved using analytic functions.
3. The other important applications of this theory is to evaluate many real integrals which can not be evaluated by usual methods.
4. In many engineering problems to establish a linear, quadratic, cubic or exponential relationship between two quantities, it is required two or more unknowns in such a way that these follow whole data, such situations occur in the problems of curve fitting etc.
5. In analyzing and interpreting data probability theory involves an element of “chance” or uncertainty, probability theory plays a vital role in the theory and application of statistics. Probability distribution is the theoretical counterpart of frequency distribution and plays an important role in the theoretical study of populations

**Course Outcomes:**

Upon successful completion of this course, students will be able to:

1. Solve the Fourier Transform of function.
2. Compute poles & zeros.
3. Evaluate the real & complex integrals with the help of Cauchy’s Residue Theorem.
4. Utilize curve fitting techniques for data representations and computation in engineering analysis.
5. Use Binomial, Poisson & Normal Distribution to solve statistical problems.

STRENGTH OF MATERIALS (BME-301)

L T P C 3 1 2 5

**Prerequisite:** Students must have knowledge of engineering mechanics engineering basic application

**Course Content:**

**Unit I**

**Stresses in Beams:** Review of pure Bending. Direct and shear stresses in beams due to transverse and axial loads, composite beams.

**Curved Beams:** Bending of beams with large initial curvature, position of neutral axis for rectangular, trapezoidal and circular cross sections, stress in crane hooks, stress in circular rings subjected to tension or compression.

**Unit II**

**Unsymmetrical Bending:** Properties of beam cross-section, slope of neutral axis, stress and deflection in unsymmetrical bending, determination of shear center and flexural axis (for symmetry about both axis and about one axis) for I-section and channel section.

**Deflection of Beams:** Shear Force and Bending Moment Diagram, Flexural rigidity, Equation of elastic curve, cantilever and simply supported beams, Macaulay's method, area moment method Fixed beams. Castigliano's Theorem

**Unit III**

**Helical and Leaf Springs:** deflection of springs by energy method, helical springs under axial load and under axial twist (respectively for circular and square cross sections) axial load and twisting moment acting simultaneously both for open and closed coiled springs, laminated springs.

**Unit IV**

**Columns and Struts:** Combined bending and direct stress, middle third and middle quarter rules. Struts with different end conditions. Euler's theory and experimental results, Rankine Gordon Formulae, Examples of columns in mechanical equipments and machines.

**Unit V**

**Thin cylinders & spheres:** Hoop and axial stresses and strain. Volumetric strain.

**Thick cylinders:** Radial, axial and circumferential stresses in thick cylinders subjected to internal or external pressures, Compound cylinders Stresses due to interference fits.

**Text and Reference Books:**

**Textbooks:**

1. Engineering Mechanics by R.K.Bansal 2. Strength of Materials by R.K. Rajput **Reference books:**
2. Engineering Mechanics by Irving H. Shames, Prentice-Hall
3. Mechanics of Materials by E.P.Popov, PHI
4. Strength of Materials by Ryder
5. Mechanics of Material by Gere & Timoshenko
6. Engineering Mechanics by A. Nelson
7. Engineering Mechanics by U.C. Jindal
8. Engineering Mechanics Statics by J.L. Meriam & L.G.Kraige

**BUILDING MATERIALS & CONSTRUCTION (BCE 301)**

**LTPC 3 0 2 4**

**Unit-I**

**Building Materials: Bricks, Stone, Lime, Timber, Plastics & Glass**

Introduction: Materials and types, properties of engineering materials, selection of materials, standard.

Bricks: Classification, manufacture, properties and selection criteria of burnt clay bricks, tests for bricks.

Stone: Classification, characteristics of good building stone, common building stones in India.

Lime: IS specifications, field tests of limes.

Timber: Characteristics of good timber, defects, seasoning, tests on timber, plywood. Plastics: Types, properties and uses.

Glass: Types and uses

**Unit-II**

**Building Materials: Cement, Admixtures, Aggregate & Mortar**

Cement: Manufacture of cement, types of cement – ordinary Portland cement, Portland pozzolana cement, high alumina cement, sulphate resisting, Portland cement, their

characteristics, composition, use and properties, tests on cements

Admixtures: Mineral admixtures, chemical admixtures

Aggregates: Classification, source, physical and mechanical properties, testing of aggregates

Mortar: Types, classification and strength, I.S. specifications

Modern Building Materials

**Unit-III**

**Building Construction: Masonry Works & Building Byelaws**

Building bye-laws: Classification of buildings, recommendations of NBC, Building byelaws, modular coordination-orientation of buildings, desirable conditions of comforts, components of building, area considerations

Masonry: Brick masonry, stone masonry, types of walls, partition and cavity walls, prefabricated construction, plastering and pointing, damp proofing materials and techniques

**Unit-IV**

**Building Construction: Foundation, Floor, Roof, Stairs, Lifts and Escalators**

Foundation: Types of foundation and selection criteria

Floor : Types of floors, construction details and selection criteria

Roofs : Types of roofs and roof covering, shuttering, scaffolding and centering

Stairs : Types of stairs, materials, proportions

Lifts and escalators: Utilities and types



**Unit-V**

**Building Construction: Doors, Windows, Finishes & Building Protections**

Doors and windows: Types, sizes, purpose of doors and windows

Finishes: White washing, colour washing, painting, distempering

Protections: Fire protection, acoustics and sound insulation, expansion and construction joints, anti-termite treatment, roof treatment for water proofing.

**BUILDING MATERIALS & CONSTRUCTION LAB (BCE 351)**

**List of Experiments**

1. Cement
  - Normal consistency of cement
  - Initial & final setting time of cement
  - Compressive strength of cement
  - Fineness of cement
  - Soundness of cement
2. Coarse Aggregate
  - Sieve analysis of aggregate
  - Water absorption of aggregate
  - Specific gravity and bulk density of aggregate
  - Crushing value of aggregate
  - Impact value of aggregate
3. Fine Aggregate
  - Sieve analysis of sand
  - Silt content of sand
  - Bulking of sand
4. Bricks
  - Water absorption
  - Dimensional tolerances
  - Compressive strength
  - Efflorescence
5. Physical and mechanical properties of reinforcing steel

**References:**

1. Arora, S.P. & Bindra, S. P., —A text book of building construction, Dhanpat Rai & Sons, Delhi.
2. Jha, J. & Sinha, S.K., —Building construction, Khanna Publishers, Delhi.
3. Kulkarni, C.J., —A text book of engineering materials, Ahmedabad Book Depot, Ahmedabad.
4. Kulkarni, C. J., —A text book of engineering construction, Ahmedabad Book Depot, Ahmedabad.
5. Kumar, S., —Engineering materials, Standard Publishers Distributors, Delhi.
6. Kumar, S., —Building construction, Standard Publishers Distributors, Delhi.
7. McKay W.B., —Building construction, Vol.1 to 4, Orient Longman Ltd, Delhi.
8. Punmia, B.C., —A text book of building construction, Laxmi Publications, Delhi, Madras.
9. Singh, S., —Engineering materials, Konark Publishers Pvt. Ltd.
10. Civil engineering materials, TTTI Chandigarh, Tata McGraw- New Delhi.
11. Somayaji, S., —Civil engineering materials, Pearson, New Delhi

**SURVEYING-I (BCE 303)**

**L T P C 3 1 2 5**

**Unit-I**

**Introduction**

Importance of surveying to engineers —Examples from different fields; Plane and Geodetic Surveying, Classification of surveys, Methods of locating a point, Sources of error, Types of errors, Principle of working from whole to part.

**Measurement of Distances**

Measurement by chain and tape. Sources of errors and precautions, Corrections to tape measurements, Field problems, Introduction of modern trends: EDM and Total Stations.

**Unit-II**

**Measurements of Angles and Directions**

**Compass Surveying:** Reference meridians, Bearing and azimuths, Magnetic declination and its variations, Use and adjustment of compass.

**Theodolite Surveying:** Vernier theodolite, micro-optic and electronic theodolites, Temporary and permanent adjustments, Measurement of horizontal and vertical angles Permanent adjustments.

**Unit-III**

**Traversing**

Principles of traversing by compass and theodolite, Field work and checks, Computation of coordinates, Sources of errors, Precision of traversing, Checking and adjusting of traverse, Omitted measurements, Gale's traverse table.

**Tacheometry**

Definitions, Principles of stadia systems, Instrument constants, Subtense and tangential systems, Construction and use of Reduction Tacheometers, Errors and Precision.

**Unit IV**

**Plane Table Surveying**

Principle, Advantages and disadvantages, Plane Table equipments, Use of telescopic alidade and self reducing alidades, Different methods of Plane Table Surveying, Resectioning -Two and three point problems, Advantages and disadvantages of Plane Table surveying.

**Unit-V**

**Measurements of Elevation and Contouring**

Different methods of determining elevation; Spirit levelling: Definition of terms, principle, Level parts, Temporary and permanent adjustments of levels. Automatic levels, various Levelling staffs, Methods of spirit levelling, Booking and reduction of fields notes, Curvature and refraction, Reciprocal leveling, Construction and field use of altimeter, Trigonometric levelling-simple and reciprocal observations, Sources of errors and precision of levelling procedures. Definition and characteristics of contours, Use of contour maps, Direct and Indirect methods of contouring.

**SURVEYING-I LAB (BCE 352)**

**List of Experiments**

1. To study instruments used in chain surveying and to measure distance between two points by ranging.
2. To determine the bearing of sides of a given traverse using Prismatic Compass and plotting of the traverse.
3. To plot details using radiation and intersection methods in plane tabling.
4. To solve two point and three point problem in plane table.
5. To find out the reduced levels of given points using level. (Reduction by Height of collimation method and Rise and fall method).
6. To determine and draw the longitudinal and cross-section profiles along a given route.
7. Practice for temporary adjustments of a Vernier Theodolite and taking Horizontal and Vertical angular measurements, by Reiteration method.
8. Measurement of horizontal using Theodolite angles by Repetition method.
9. Determination of the Tacheometric constants of a given theodilite.

**References :**

1. Agor, R. —Surveying, Vol. I & II, Khanna Publications, Delhi,
2. Arora, K.R., —Surveying, Vol. I & II, Standard Book House, Delhi,
3. Bannister, A. and Baker, R., —Solving Problems in Surveying, Lorigman Scientific Technical, U.K., 1994.
4. Kennie, T.J.M. and Petrie, G., —Engineering Surveying Technology, Blackie & Sons Ltd., London, 1990.
5. Punmia, B.C., —Surveying, Vol. I & II, Laxmi Publications New Delhi,
6. Duggal, S.K., —Surveying, Vol. I & II, TMH Education
7. Basak, —Surveying, TMH Education.
8. Kanetkar, —Surveying, Vol.1, II. Pune Vidyarthi Griha Prakashan
9. Chandra, A.M. —Plane Surveying, New Age International Publishers, Delhi
10. Chandra, A.M. —Higher Surveying, New Age International Publishers, Delhi

**BCE – 302 WATER RESOURCES ENGINEERING**

**L T P C 3-0-0-3**

**UNIT – I**

Hydrology : Hydrologic Cycle. Water Budget Equation, Hydrologic system, Precipitation : Types, measurements and analysis, error in estimation, missing data, consistency of rainfall records, Intensity during frequency (IDF) and probabilistic maximum Precipitation (PMP) curves.

Evaporation and consumptive use: Process affecting factors, estimation and measurement techniques.

Infiltration : Process affecting factors, measurement and estimation, Infiltration Indices. 8

**UNIT – II**

Surface Runoff: Components and factors affecting runoff, methods of estimation of runoff volume and peak runoff, rating curve, Rainfall – runoff relationships Hydrograph analysis: components, factors affecting hydrographs, base flow separation, Direct Runoff Hydrograph, Unit Hydrograph: Theory and assumptions. Derivation of Unit Hydrograph, Synthetic Unit Hydrograph Introduction to computer models for rainfall runoff analysis.

Irrigation: Developments in India, Necessity and types Advantages & disadvantages of irrigation. Functions of water in plant growth, Methods of Irrigation, Water requirement of crops. Irrigation frequency, Irrigation efficiencies, Principal crops and crop season, crop rotation.

Canal irrigation: Classes and alignment, Parts of a canal system, Commanded area, curves in channels, channel losses. 8

**UNIT – III**

Sediment Transportation: Suspended and Bed load and its estimation

Irrigation channels: Types: lined and unlined, silt theories: Kennedy's and Lacey's Design procedure for irrigation channels, Longitudinal cross section, Schedule of area

statistics and channel dimensions, use of Garret's Diagrams in channel design, cross sections of an Irrigation channel, Computer programs for design of channels

Lining of Irrigation Canals: Advantages and types, factors for selection of a particular type, design of lined channels, cross section of lined channels, Economics of canal lining. Water Logging: Definition, effects, causes and anti-water logging measures, Drainage of water logged land, Types of drains open and closed, spacing of closed drains. 8

**UNIT – IV**

Regulation and control of canal system: Purpose, Types of canal regulation works and their functional aspects

Irrigation Outlets: Requirements, types, non-modular, semi-module and rigid module, selection criterion

River Training: Objective and need, classification of rivers, and river training works, meandering, stages, methods of river training, bank protection, Methods for measurement of discharge. 8

**UNIT – V**

Ground Water Hydrology: Zones of underground water, Aquifers and their types, important terms, Determination of discharge through unconfined and confined aquifers with steady flow conditions, Interference among wells, determination of aquifer constants, Well loss and specific capacity, efficiency of a well, types of water wells, bored and open wells, specific yield of a well, Relative merits of well and canal irrigation, type of tube wells, well surrounding and well development, Suitable site selection for a tube well, Types of open wells, Methods of lifting water. Infiltration galleries. 8

**Text Book**

1. Irrigation Engg. and Hydraulic Structures by S.K. Garg, Khanna Publishers.
2. Irrigation and water Power engineering by B.C. Punmia, Laxmi Publications.
3. Engineering Hydrology by K. Subramanya, TMH.
4. Irrigation Water Power and Water Resource Engg. by K.R. Arrora.
5. Water resource engineering by Ralph A. Wurbs & Wesley P. James, Pearson Publication

**References**

1. Water Resources Engg. By Larry W. Mays, John Wiley India
2. Water resources Engg. By Wurbs and James, John wiley India
3. Water Resources Engg. By R. K. Linsley, McGraw Hill
4. Irrigation and water Resources Engg. By G L Asawa, New age International Publishers
5. Irrigation Theory and practices by A.M. Michel.
6. Fundamental of Hydraulic Engineering System by Houghalen, Pearson Publication.

**UNIT-I:** Nature of Environment Introduction to Environmental Science - Definition and scope and need for public awareness Ecosystems Concept, structure and functions, restoration of damaged ecosystems Biodiversity – Definition, description at national and global level, threats and conservation Natural Resources - Renewable and non-renewable and their equitable use for sustainability, Material cycles – carbon, nitrogen and sulphur cycle. Conventional and Non-conventional Energy Sources – fossil fuel-based, hydroelectric, wind, -nuclear and solar energy, biomass, biodiesel, hydrogen as an alternative fuel

**UNIT-II:** Impact of Human Activity on Environment Human Population and Environment – Population growth, population explosion and migration; Impact of farming, housing, mining, transportation and industrial growth Social Issues Related to Environment– Sustainable development, urban problems (related to water and energy conservation and waste management), resettlement and rehabilitation Environmental ethics

**UNIT-III:** Environmental Changes and Human Health Environmental Pollution–Definition, causes and effects, control measures for water, air, soil, marine, land, noise, thermal pollution, Climate change– Greenhouse effect and global warming, acid rain, ozone layer formation and depletion Impact on human health – water and air borne diseases, diseases induced by residual impurities in drinking water (fluoride and arsenic); Toxic wastes and carcinogens; Nuclear hazards

**UNIT- IV:** Environmental Protection through Assessment and Education Indicators and Impact Assessment – Bio-indicators, Natural disasters and disaster management, Impact assessment through inventorying and monitoring Environmental Protection– Role of individuals, organizations and government in pollution control Laws, Conventions and Treaties–National legislation, issues in the enforcement of environmental legislation, initiatives by non- governmental organizations, global efforts in environmental protection Environmental education–women and value education Recommended

**Textbook:** Environmental Studies, J Krishnawamy , R J Ranjit Daniels, Wiley India. **Recommended Reference Books:**

1. Environmental Science, Bernard J. Nebel, Richard T. Right, 9780132854467, Prentice Hall Professional 1993.
2. Environment and Ecology, R K Khandal, 978-81-265-4277-2, Wiley India.
3. Environmental Science, 8th Ed ISV, Botkin and Keller, 9788126534142, Wiley India.
4. Environmental Studies, R Rajagopalan, 978-0195673937, Oxford University Press
5. Textbook of Environmental Science and Technology, M.Anjireddy, BS Publications
6. Environmental Studies, Soli. J Arceivala, Shyam, R Asolekar, 9781259006050, McGrawHill India, 2012.
7. Environmental Studies, D.L. Manjunath, 9788131709122 Pearson Education India, 2007
8. Textbook of Environment Ecology, Singh, Acme Learning
9. Perspective in Environmental Studies, Kaushik, New Age International
10. Environmental Studies, B. Joseph, 2nd Ed, 978-0070648134, Tata McGraw Hill

## IV SEMESTER

### UNIT-I

#### Introduction:

Scope and importance of Fluid Mechanics, Physical properties of fluids (density, specific weight, specific volume, sp. gravity, viscosity-Newton's law of viscosity, Newtonian and nonNewtonian fluids, Compressibility, Surface tension and Capillarity, Vapour Pressure), Rheological classification of fluids, Ideal fluid, Real fluid.

#### Fluid Statics:

Pressure, Pascal's Law, Hydrostatic Law, Pressure measurement devices – Piezometer, manometers, Mechanical gauges, Forces on plane and curved surfaces, Centre of pressure and pressure diagram, Buoyancy, Metacentre, Stability of Submerged and floating bodies, Fluid masses subjected to accelerations.

### UNIT-II

#### Fluid Kinematics:

Concept of control volume, Velocity and acceleration of fluid Particle, Lagrangian and Eulerian approach, Classification of fluid flow (steady- unsteady, uniform-nonuniform, rotational – irrotational, turbulent–laminar, 1-D,2-D, 3-D flow, compressible - incompressible flow), Streamlines, Path lines and Streak lines, Equipotential lines, Stream Function and Velocity Potential, Flow Net, Continuity equation, Rotation, Vorticity and Circulation, Free and Forced vortex motion.

### UNIT-III

#### Fluid Dynamics:

Concept of control volume and control surface, Forces acting on fluid in motion, Euler's equation, Bernoulli's Theorem and applications – Pitot Tube, Venturimeter, Orificemeter, Orifices and Mouthpieces, Concept of HGL & TEL.

**Dimensional Analysis:** Units and Dimensions, Dimensional analysis, Rayleigh's method, Buckingham's  $\Pi$  theorem, Non-dimensional numbers & their significance.

**Hydraulic Similitude and Model Studies:** Model and prototype; Similitude; Geometric, Kinematic and Dynamic similarity; Model Laws; Un-distorted model studies.

### UNIT-IV

#### Flow in pipes:

Laminar flow: Reynold's Experiment, Coutte& Hazen Poissulle's Equation for viscous flow between parallel plates and circular pipes, Stokes law; Flow through porous media; Darcy's Law; Fluidization; Measurement of viscosity; Transition from laminar to turbulent flow. Turbulant flow: Velocity distribution and Shear stresses in turbulent flow, Prandtl mixing length theory, Introduction to Moody's Chart.

#### Losses in pipes:

Darcy - Wiesbach Equation, factors affecting friction, Minor Losses in pipes, Concept of equivalent length of pipe for different pipe fittings, Equivalent diameter of pipes, Hydraulic Power, transmission by pipe, Pipes in parallel, Series, Syphon, two reservoir problems, Water hammer in pipes, Surge tanks - function, location and uses, Pipe network.



**Unit-V**

**Boundary layer theory:**

Concept, Boundary layer along thin plate- Characteristics, Laminar, Turbulent Boundary Layer, laminar sub layer, Various Thicknesses- Nominal, displacement, Momentum, Energy, Hydraulically smooth and Rough boundaries, Separation of Boundary layer, control of Separation.

**Forces on submerged bodies:** Introduction to Drag and Lift on submerged bodies (like Flat plates, Sphere, Cylinder, aerofoil), stokes law, Drag and Lift coefficients.

**ENGINEERING FLUID MECHANICS LAB (BCE 451)**

**List of Experiments: (At least 8 of the following)**

1. To determine the metacentric height of a ship model experimentally.
2. To study the transition from laminar to turbulent flow and to determine the lower critical Reynolds number.
3. To determine the coefficients of velocity, contraction and discharge of an orifice (or a mouth piece) of a given shape.
4. To find the velocity distribution in a pipe and hence to compute the discharge by integrating the velocity profile obtained.
5. To verify the Bernoulli's theorem.
6. To determine coefficient of discharge of a nozzle.
7. To calibrate an orifice meter and venturimeter and to study the variation of the coefficient of discharge with the Reynolds number.
8. To verify Darcy's law and to find out the coefficient of permeability of the given medium.
9. To study the variation of friction factor,  $f$  for turbulent flow in smooth and rough commercial pipes.
10. To determine the loss coefficients for the various pipe fittings.
11. To study the flow visualization with help of water table set up

**References:**

1. Fluid Mechanics – A.K. Jain – Khanna Pub., Delhi
2. Fluid Mechanics – Hydraulic & Hydraulic Mechanics -Modi / Seth – Standard Book House, Delhi
3. Fluid Mechanics – Streeter-McGraw-Hill International Book Co., Auckland
4. Fluid Mechanics – Garde-Mirajgaonkar – Nemchand& Bros., Roorkee
5. Fluid Mechanics – Shames - McGraw-Hill International Book Co., Auckland 6. Som and Biswas: Introduction to
6. Fluid Mechanics and Machines, TMH.
7. R K Bansal: Fluid Mechanics and Hydraulic Machines.
8. Fluid Mechanics & Hydraulic Machines – Domkundwar & Domkundwar, Dhanpat Rai & Co.
9. Fluid Mechanics & Hydropower Engineering – D. S. Kumar, S.K. Kataria and Sons.
10. Fluid Mechanics and Machinery – Ojha, Berndtsson and Chandramouli, Oxford University Press

## IV SEMESTER

### DISASTER MANAGEEMNT

L T P C

2 0 0 2

**Unit 1:** Introduction - Concepts and definitions: disaster, hazard, vulnerability, risks severity, frequency and details, capacity, impact, prevention, mitigation).

**Unit 2:** Disasters - Disasters classification; natural disasters (floods, draught, cyclones, volcanoes, earthquakes, tsunami, landslides, coastal erosion, soil erosion, forest fires etc.); manmade disasters (industrial pollution, artificial flooding in urban areas, nuclear radiation, chemical spills, transportation accidents, terrorist strikes, etc.); hazard and vulnerability profile of India, mountain and coastal areas, ecological fragility.

**Unit 3:** Disaster Impacts - Disaster impacts (environmental, physical, social, ecological, economic, political, etc.); health, psycho-social issues; demographic aspects (gender, age, special needs); hazard locations; global and national disaster trends; climate change and urban disasters.

**Unit 4:** Disaster Risk Reduction (DRR) - Disaster management cycle – its phases; prevention, mitigation, preparedness, relief and recovery; structural and non-structural measures; risk analysis, vulnerability and capacity assessment; early warning systems, Post disaster environmental response (water, sanitation, food safety, waste management, disease control, security, communications); Roles and responsibilities of government, community, local institutions, NGOs and other stakeholders; Policies and legislation for disaster risk reduction, DRR programmes in India and the activities of National Disaster Management Authority.

**Unit 5:** Disasters, Environment and Development - Factors affecting vulnerability such as impact of developmental projects and environmental modifications (including of dams, land use changes, urbanization etc.), sustainable and environmentally friendly recovery; reconstruction and development methods.

#### Text/Reference Books:

1. <http://ndma.gov.in/> (Home page of National Disaster Management Authority)
2. <http://www.ndmindia.nic.in/> (National Disaster management in India, Ministry of Home Affairs).
3. Pradeep Sahni, 2004, Disaster Risk Reduction in South Asia, Prentice Hall.
4. Singh B.K., 2008, Handbook of Disaster Management: Techniques & Guidelines, Rajat Publication.
5. Ghosh G.K., 2006, Disaster Management, APH Publishing Corporation
6. Disaster Medical Systems Guidelines. Emergency Medical Services Authority, State of California, EMSA no.214, June 2003
7. Inter Agency Standing Committee (IASC) (Feb. 2007). IASC Guidelines on Mental Health and Psychosocial Support in Emergency Settings. Geneva: IASC

#### Outcomes:

1. The student will develop competencies in the application of Disaster Concepts to Management
2. Analyzing Relationship between Development and Disasters.
3. Ability to understand Categories of Disasters and realization of the responsibilities to society

**UNIT-I**

Analysis of Beams: - Determination of reaction, shear force and bending moment for simply supported beam. Classification of Structures, stress resultants, degrees of freedom per node, Static and Kinematic determinacy. Classification of Pin jointed determinate trusses, Analysis of determinate plane and space trusses (compound and complex). Method of Substitution and Method of tension coefficient.

**UNIT-II**

Rolling loads, influence lines for beams and trusses, Absolute maximum bending moment, Muller-Breslau's principle & its application for determinate structures.

**UNIT-III**

Analysis of Arches, Linear arch, Eddy's theorem, three hinged parabolic arch, spandrel braced arch, moving load & influence lines.

**UNIT-IV**

Strain Energy of deformable systems, Maxwell's reciprocal & Betti's theorem, Castigliano's first theorem, unit load & Conjugate beam methods.

**UNIT-V**

Unsymmetrical bending, location of neutral axis, computation of stresses and deflection, Shear Centre its location for common structural section. Bending of curved bars in plane of bending, stresses in bars of small & large initial curvatures.

**Unit 1:** *Estimation* / Measurements for various items- Introduction to the process of Estimation; Use of relevant Indian Standard Specifications for the same, taking out quantities from the given requirements of the work, comparison of different alternatives, Bar bending schedules, Mass haul Diagrams, Estimating Earthwork and Foundations, Estimating Concrete and Masonry, Finishes, Interiors, MEP works; BIM and quantity take-offs; adding equipment costs; labour costs; rate analysis; Material survey-Thumb rules for computation of materials requirement for different materials for buildings, percentage breakup of the cost, cost sensitive index, market survey of basic materials. Use of Computers in quantity surveying (7 lectures)

**Unit 2:** Specifications-Types, requirements and importance, detailed specifications for buildings, roads, minor bridges and industrial structures. (3 lectures)

**Unit 3:** Rate analysis-Purpose, importance and necessity of the same, factors affecting, task work, daily output from different equipment/ productivity. (3 lectures)

**Unit 4:** Tender- Preparation of tender documents, importance of inviting tenders, contract types, relative merits, prequalification. general and special conditions, termination of contracts, extra work and Changes, penalty and liquidated charges, Settlement of disputes, R.A. Bill & Final Bill, Payment of advance, insurance, claims, price variation, etc. Preparing Bids- Bid Price buildup: Material, Labour, Equipment costs, Risks, Direct & Indirect Overheads, Profits; Bid conditions, alternative specifications; Alternative Bids. Bid process management (6 lectures)

**Unit 5:** Introduction to Acts pertaining to-Minimum wages, Workman's compensation, Contracts, Arbitration, Easement rights. (1 lecture)

**Term Work Assignments may include:**

1. Deriving an approximate estimate for a multistoried building by approximate methods.
2. Detailed estimate for the following with the required material survey for the same.
  - a. Ground plus three storied RCC Framed structure building with blockwork walls
  - b. bridge with minimum 2 spans
  - c. factory building
  - d. road work
  - e. cross drainage work
  - f. Ground plus three storied building with load-bearing walls
  - g Cost of finishes, MEP works for (f) above
3. Preparation of valuation report in standard Government form.
4. Assignments on rate analysis, specifications and simple estimates.
5. Detailed estimate of minor structure.
6. Preparation of Bar bending schedule.

**Text/Reference Books:**

1. Mankiw Gregory N. (2002), *Principles of Economics*, Thompson Asia
2. V. Mote, S. Paul, G. Gupta(2004), *Managerial Economics*, Tata McGraw Hill
3. Misra, S.K. and Puri (2009), *Indian Economy*, Himalaya
4. Pareek Saroj (2003), *Textbook of Business Economics*, Sunrise Publishers
5. M Chakravarty, *Estimating, Costing Specifications & Valuation*
6. Joy P K, *Handbook of Construction Management*, Macmillan
7. B.S. Patil, *Building & Engineering Contracts*
8. Relevant Indian Standard Specifications.
9. World Bank Approved Contract Documents.
10. FIDIC Contract Conditions.
11. Acts Related to Minimum Wages, Workmen's Compensation, Contract, and Arbitration
12. Typical PWD Rate Analysis documents.
13. UBS Publishers & Distributors, *Estimating and Costing in Civil Engineering: Theory and Practice including Specification and Valuations*, 2016
14. Dutta, B.N., *Estimating and Costing in Civil Engineering (Theory & Practice)*, UBS Publishers, 2016

**On completion of the course, the students will:**

1. Have an idea of Economics in general, Economics of India particularly for public sector agencies and private sector businesses
2. Be able to perform and evaluate present worth, future worth and annual worth analyses on one of more economic alternatives.
3. Be able to carry out and evaluate benefit/cost, life cycle and breakeven analyses on one or more economic alternatives.
4. Be able to understand the technical specifications for various works to be performed for a project and how they impact the cost of a structure.
5. Be able to quantify the worth of a structure by evaluating quantities of constituents, derive their cost rates and build up the overall cost of the structure.
6. Be able to understand how competitive bidding works and how to submit a competitive bid proposal.

**UNIT – 1**

Origin and classification: Preview of Geotechnical field problems in Civil Engineering, Soil formation, transport and deposit, Soil composition, Basic definitions, Weight volume relationships, Clay minerals, Soil structure, Index properties, Particle size analysis, Soil classification.

**UNIT – 2**

Soil Hydraulics: Modes of occurrence of water in soil. Stress conditions in soil- total, effective and neutral stresses and relationships. Permeability - Bernoulli's equation, Darcy's Law, hydraulic conductivity, laboratory determination of hydraulic conductivity, equivalent hydraulic conductivity in stratified soil. Seepage- Laplace equation of continuity, flow nets, seepage calculation from a flow net, flow nets in anisotropic soils, seepage through earth dam, critical hydraulic gradient and quick sand condition. Soil compaction, water content – dry unit weight relationships. Factors controlling compaction. Field compaction equipment; field compaction control; Proctor needle method.

**UNIT – 3**

Stresses in soils: Normal and shear Stresses on a plane, Stresses due to applied loads, Boussinesq's solution for a point load, line load, strip load, uniformly loaded circular and rectangular areas, Isobar and pressure bulb concept, stress distribution on horizontal and vertical planes, Newmark's chart and its application, contact pressure. Consolidation: Consolidation and compaction, primary and secondary consolidation, Terzaghi's one dimensional theory of consolidation, Consolidation test, Normal and Over Consolidated soils, Over Consolidation Ratio, determination of coefficient of consolidation, consolidation under construction loading.

**UNIT – 4**

Shear Strength: Mohr-Coulomb failure criterion, shear strength parameters and determination; direct and tri-axial shear test; unconfined compression test; vane shear test; sensitivity and thixotropy; pore pressure, Skempton's pore pressure coefficients. Earth pressure: Classical theories, Coulomb and Rankine approaches for frictional and  $c-\phi$  soils, Smooth and rough walls, Inclined backfill, graphical methods of earth pressure determination. Types of retaining structures.

**UNIT – 5**

Characterization of ground, site investigations, groundwater level, methods of drilling, sampling, in situ tests, SPT, CPT, DCPT.

**Sub-Structures:** Introduction to foundations- types and differences; choice; loads; design philosophies. Bearing capacity of shallow foundations; modes of failures; corrections for size, shape, depth and eccentricity; provisions of IS code of practice. Introduction to deep foundations.

**Note:** The students should be given a comprehensive problem at the end which requires inputs/ knowledge/ application from all the units of the syllabus. It may be evaluated as a part of TAQ•

**Text & References Books**

1. V.N.S. Murthy – Soil Mechanics and Foundation Engineering (Fifth Edition)
2. K.R. Arora – Soil Mechanics and Foundation Engineering
3. Narasinga Rao, B.N.D, “Soil Mechanics & Foundation Engineering”, John Wiley & Sons, Wiley India Pvt. Ltd., Daryaganj, New Delhi – 110 002.
4. Alam Singh – Modern Geotechnical Engineering
5. Brij Mohan Das – Geotechnical Engineering , CENGAGE Learning
6. I.H. Khan – Text Book of Geotechnical Engineering
7. C. Venkataramaiah – Geotechnical Engineering
8. Gopal Ranjan and A.S.R. Rao – Basic and Applied Soil Mechanics
9. G.V. Rao & G.V.S.S. Raju – Engineering with Geosynthetics
- 10.P. Purushottam Raj- Soil Mechanics and Foundation Engineering, Pearson Education in South Asia, New Delhi.
11. Shenbaga R Kaniraj- Design Aids in Soil Mechanics and Foundation Engineering
- 12.Gulati, S.K., “Geotechnical Engineering” McGraw Hill Education (India), Pvt. Ltd., Noida. Course Content

**GEOTECH ENGINEERING LAB (BCE 454)**

1. Identification of gravel type, sand type, silt type and clay types soils; Tests for determination of Specific gravity (for coarse- and fine-grained soils) and Water content (Oven drying method).
2. Grain size analysis of soil sample (sieve analysis).
3. In situ density by core cutter and sand replacement methods.
4. Consistency Limits – Liquid Limit (Casagrande and Cone Penetration Methods), plastic limit and shrinkage limit.
5. Standard Proctor Compaction Test and Modified Proctor Compaction Test.
6. Coefficient of permeability by constant head and variable head methods.
7. Strength Tests
  - a. Unconfined Compression Test
  - b. Direct Shear Test
  - c. Triaxial Compression Test (undrained)
8. Consolidation Test- Determination of compression index and coefficient of consolidation.
9. Laboratory vane shear test
10. Determination of CBR value
11. a) Demonstration of miscellaneous equipments such as Augers, Samplers, Rapid Moisture meter, Proctor’s needle.
  - b) Demonstration of Hydrometer Test.
  - c) Demonstration of Free Swell Index and Swell Pressure Test
  - d) Demonstration of determination of relative density of sands.
12. Preparing a consolidated report of index properties and strength properties of soil

## Human Values and Professional Ethics (MC 402/MC 302)

### Course Objective

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1. To help the students in distinguishing between values and skills, and understand the need, basic guidelines, content and process of value education.
2. To help the students initiate a process of dialog within themselves to know what they ‘really want to be’ in their life and profession
3. To help the students to understand the meaning of happiness and prosperity for a human being.
4. To facilitate the students to understand harmony at all the levels of human living, and live accordingly.
5. To facilitate the students in applying the understanding of harmony in existence in their profession and lead an ethical life

### Course Outcome

On completion of this course, the students will be able to:

1. Understand the significance of value inputs in a classroom, distinguish between values and skills, understand the need, basic guidelines, content and process of value education, explore the meaning of happiness and prosperity and do a correct appraisal of the current scenario in the society
2. Distinguish between the Self and the Body, understand the meaning of Harmony in the Self the Co-existence of Self and Body.
3. Understand the value of harmonious relationship based on trust, respect and other naturally acceptable feelings in human-human relationships and explore their role in ensuring a harmonious society
4. Distinguish between ethical and unethical practices, and start working over the strategy to actualize a harmonious environment wherever they work.

### UNIT-1 Course Introduction - Need, Basic Guidelines, Content and Process for Value Education

Understanding the need, basic guidelines, content and process for Value Education, Self-Exploration–what is it? - its content and process; ‘Natural Acceptance’ and Experiential Validation- as the mechanism for self-exploration, Continuous Happiness and Prosperity- A look at basic Human Aspirations, Right understanding, Relationship and Physical Facilities- the basic requirements for fulfilment of aspirations of every human being with their correct priority, Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario, Method to fulfill the above human aspirations.

**UNIT-2** Understanding Harmony in the Human Being - Harmony in Myself Understanding human being as a co-existence of the sentient ‘I’ and the material ‘Body’, Understanding the needs of Self (‘I’) and ‘Body’ - Sukh and Suvidha, Understanding the Body as an instrument of ‘I’ (I being the doer, seer and enjoyer), Understanding the characteristics and activities of ‘I’ and harmony in ‘I’, Understanding the harmony of I with the Body: Sanyam and Swasthya; correct appraisal of Physical needs, meaning of Prosperity in detail, Programs to ensure Sanyam and Swasthya.



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- UNIT-3** Understanding Harmony in the Family and Society- Harmony in Human-Human Relationship  
Understanding harmony in the Family- the basic unit of human interaction, Understanding values in human-human relationship; meaning of Nyaya and program for its fulfillment to ensure Ubhay-tripti (Mutual Happiness); Trust (Vishwas) and Respect (Samman) as the foundational values of relationship, Understanding the meaning of Vishwas; Difference between intention and competence, Understanding the meaning of Samman, Difference between respect and disrespect; the other salient values in relationship, Understanding the harmony in the society (society being an extension of family): Samadhan, Samridhi, Abhay, Sah-astitva as comprehensive Human Goals, Visualizing a universal harmonious order in society.
- UNIT-4** Understanding Harmony in the Nature and Existence - Whole existence as Co-existence  
Understanding the harmony in the Nature, Interconnectivity and mutual fulfilment among the four orders of nature- recyclability and self-regulation in nature, Understanding Existence as Co-existence (Sah-astitva) of mutually interacting units in all-pervasive space, Holistic perception of harmony at all levels of existence.
- UNIT-5** Implications of the Holistic Understanding of Harmony on Professional Ethics  
Natural acceptance of human values, Definitiveness of Ethical Human Conduct, Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order, Competence in Professional Ethics: a) Ability to utilize the professional competence for augmenting universal human order, b) Ability to identify the scope and characteristics of people-friendly and eco-friendly production systems, technologies and management models. Improving quality of work life at work place.

### Text Books:

### References:

1. R R Gaur, R Sangal, G P Bagaria, 2009, A Foundation Course in Human Values and Professional Ethics.
2. A Nagraj, 1998, Jeevan Vidya Ek Parichay, Divya Path Sansthan, Amarkantak
3. R. Subramanian, 2017, Professional Ethics,
4. P L Dhar, RR Gaur, 1990, Science and Humanism, Commonwealth Publishers.
5. A N Tripathy, 2003, Human Values, New Age International Publishers.
6. SubhasPalekar, 2000, How to practice Natural Farming, Pracheen (Vaidik) KrishiTantraShodh, Amravati.
7. E G Seebauer & Robert L. Berry, 2000, Fundamentals of Ethics for Scientists & Engineers , Oxford University Press.
8. M Govindrajran, S Natrajan & V.S. Senthil Kumar, Engineering Ethics (including Human Values), Eastern Economy Edition, Prentice Hall of India Ltd.
9. B P Banerjee, 2005, Foundations of Ethics and Management, Excel Books.
10. B L Bajpai, 2004, Indian Ethos and Modern Management, New Royal Book Co., Lucknow. Reprinted 2008.

## SYLLABUS

### UNIT - 1 Communication

What is communication- its meaning and importance, Barriers of communication, Effective communication- Essentials of good communication, Types of communication- verbal (oral & written) & Non-Verbal. Salient features of technical communication: Tone, voice and diction, Difference between technical writing and general writing.

### UNIT - 2 Business Correspondent

General principles of business correspondence, Seven C's of business communication, Letters of instructions, inquiries and answers to enquiries, complaints and adjustments. Employment letters, application and resumes, Circulars, Notices, E-mails.

### UNIT - 3 Proposal writing

Proposal: Definition and kinds, Division of format proposals (front matter, title page, summary/abstract, Table of contents etc.) Statement of purpose, Statement of request, body-statement of problem,

### UNIT - 4 Report Writing

Characteristics of business reports, Structure of reports, Style of Reports, Choice of Words of Phrases, Construction and length of Sentences, Construction and length of Paragraphs. Types of reports: Formal Report, Periodic Report, Miscellaneous Report.

### Suggested Reading:

1. Sherman, Theodore A. (et.al.)- Modern Technical Writing, (Apprentice Hall, New Jersey)
2. Legget, Glenn (et. al)-Essentials of Grammar and Composition (Macmillan, Delhi)
3. Strunk, Jr., William (et. al)- The Elements of Style,(Macmillan)
4. Sharma, S.D.-A Text book of Scientific and Technical Writing, (Vikas, Delhi,
5. O'Conner, J. D. Better-English Pronunciation, James Daniel-English Pronouncing
6. Dictionary, (J. M.Dent, London, .