JHARKHAND Rai University

B. Tech Sem V CE

B.TECH CE 2018-2022												
SEMESTER V												
S.No.	CATEGORY	CODE	COURSE TITLE	Periods			Evaluation Scheme				Subject Total	Credit
				L	T	P	Assignm	TA	Total	ESE		
1	Professional Core Courses	5APCCCE301	Mechanics of Materials	3	0	0	20	10	30	70	100	3
2	Professional Core Courses	5APCCCE302	Hydraulic Engineering	2	0	0	20	10	30	70	100	2
3	Professional Core Courses	5APCCCE303	Structural Engineering	3	0	0	20	10	30	70	100	3
4	Professional Core Courses	5APCCCE304	Geotechnical Engineering	2	0	0	20	10	30	70	100	2
5	Professional Core Courses	5APCCCE305	Hydrology & Water Resources Engineering	2	2	0	20	10	30	70	100	3
6	Professional Core Courses	5APCCCE306	Environmental Engineering	2	0	0	20	10	30	70	100	2
7	Professional Core Courses	5APCCCE307	Transportation Engineering	2	0	0	20	10	30	70	100	2
8	Humanities and Social Sciences including Management courses	5AHSMC302	Civil Engineering -Social & Global Impact	2	0	0	20	10	30	70	100	2
9	Mandatory Courses (non-credit)	MC301	**Constitution of India	2	0	0	20	10	30	70	100	0
10	Humanities and Social Sciences including Management courses	HSMC301	**Communication & Soft Skills	2	0	0	20	10	30	70	100	0
PRACTICAL /SESSIONAL												
1	Professional Core Courses	5APCCCE302	Hydraulic Engineering	0	0	2			30	20	50	1
2	Professional Core Courses	5APCCCE304	Geotechnical Engineering	0	0	2			30	20	50	1
3	Professional Core Courses	5APCCCE306	Environmental Engineering	0	0	2			30	20	50	1
4	Professional Core Courses	5APCCCE307	Transportation Engineering	0	0	2			30	20	50	1
									TOTAL		**1200**	**23**

** NOTE: Qualifying Non Credit Course

Program: - B. Tech
Semester: - Five
Course Code – 5APCCCE301
Course: Mechanics of Materials

L	T	P	C
3	0	0	3

Objectives:

- An ability to apply knowledge of mathematics, science, and engineering
- An ability to design a system, component, or process to meet desired needs
- An ability to identify, formulate, and solve engineering problems
- The broad education necessary to understand the impact of engineering solutions in a global and societal context
- An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

Module 1: *Deformation and Strain covering* description of finite deformation, Infinitesimal deformation; Analysis of statically determinate trusses; Stability of dams, retaining walls and chimneys; Stress analysis of thin, thick and compound cylinder;

Module 2: *Generalized state of stress and strain:* Stress and strain tensor, Yield criteria and theories of failure; Tresca, Von-Mises, Hill criteria, Heigh-Westerguard's stress space.

Module 3:*Momentum Balance and Stresses covering* Forces and Moments Transmitted by Slender Members, Shear Force and Bending Moment Diagrams, Momentum Balance, Stress States / Failure Criterion

Module 4:*Mechanics of Deformable Bodies covering* Force-deformation Relationships and Static Indeterminacy, Uniaxial Loading and Material Properties, Trusses and Their Deformations, Statically Determinate and Indeterminate Trusses,

Module 5: *Force-Stress-Equilibrium covering* Multiaxial Stress and Strain

Module 6: *Displacement – Strain covering* Multiaxial Strain and Multiaxial Stress-strain Relationships

Module 7: *Elasticity and Elasticity Bounds covering* Stress-strain-temperature Relationships and Thin-walled Pressure Vessels, Stress and strain Transformations and Principal Stress, Failure of Materials,

Module 8:*Bending: Stress and Strains; Deflections and Torsion covering* Pure Bending, Moment-curvature Relationship, Beam Deflection, Symmetry, Superposition, and Statically Indeterminate Beams, Shear and Torsion, Torsion and Twisting, Thermo elasticity, Energy methods, Variational Methods; Strain energy, elastic, complementary and total strain energy,

Strain energy of axially loaded bar, Beam in bending, shear and torsion; General energy theorems, Castigliano's theorem, Maxwell Bettie's reciprocal theorem; Virtual work and unit load method for deflection, Application to problems of beams and frames.

Module 9:*Structural stability;* Stability of columns, Euler's formula, end conditions and effective length factor, Columns with eccentric and lateral load; Plasticity and Yield Design covering 1D-Plasticity – An Energy Approach, Plasticity Models, Limit Analysis and Yield Design

Suggested Reading:

1. *Norris, C.H. and Wilber, J. B. and Utku, S. "Elementary Structural Analysis" Mc Graw Hill,Tokyo, Japan.*
2. *Timoshenko, S. and Young, D. H., "Elements of Strength of Materials", DVNC, New York, USA.*
3. *Kazmi, S. M. A., 'Solid Mechanics" TMH, Delhi, India.*
4. *Hibbeler, R. C. Mechanics of Materials. 6th ed. East Rutherford, NJ: Pearson Prentice Hall, 2004*
5. *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*
6. *Gere, J. M., and S. P. Timoshenko. Mechanics of Materials. 5th ed. Boston: PWS Kent Publishing1970.*
7. *Ashby, M. F., and D. R. H. Jones. Engineering Materials, An Introduction to their Properties and Applications.2nd ed. Butterworth Heinemann.*
8. *Collins, J. A. Failure of Materials in Mechanical Design. 2nd ed. John Wiley & Sons, 1993.*
9. *Courtney, T. H. Mechanical Behavior of Materials. Mc Graw-Hill, 1990.*

Program: - B. Tech
Semester: - Five
Course Code – 5APCCCE302
Course: Hydraulic Engineering

L	T	P	C
2	0	0	2

Objectives:

- The students will be able to apply their knowledge of fluid mechanics in addressing problems in open channels.
- They will possess the skills to solve problems in uniform, gradually and rapidly varied flows in steady state conditions.
- They will have knowledge in hydraulic machineries (pumps and turbines).

Module 1: Laminar Flow- Laminar flow through: circular pipes, annulus and parallel plates Stoke's law, Measurement of viscosity.

Module 2: 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.

Module 3: Boundary Layer Analysis-Assumption and concept of boundary layer theory. Boundary-layer thickness, displacement, momentum & energy thickness, laminar and turbulent boundary layers on a flat plate; Laminar sub-layer, smooth and rough boundaries. Local and average friction coefficients. Separation and Control.

Module 4: Dimensional Analysis and Hydraulic Similitude: 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.

Module 5: Introduction to Open Channel Flow-Comparison between open channel flow and pipe flow, geometrical parameters of a channel, classification of open channels, classification of open channel flow, Velocity Distribution of channel section.

Module 6: Uniform Flow-Continuity Equation, Energy Equation and Momentum Equation, Characteristics of uniform flow, Chezy's formula, Manning's formula. Factors affecting Manning's Roughness Coefficient. *Most economical section of ch*annel. Computation of Uniform flow, Normal depth.

Module 7: Non-Uniform Flow- Specific energy, Specific energy curve, critical flow, discharges curve Specific force Specific depth, and Critical depth. Channel Transitions. Measurement of

Discharge and Velocity – Venturi Flume, Standing Wave Flume, Parshall Flume, Broad Crested Weir. Measurement of Velocity- Current meter, Floats, Hot-wire anemometer. Gradually varied Flow-Dynamic Equation of Gradually Varied Flow, Classification of channel bottom slopes, Classification of surface profile, Characteristics of surface profile. Computation of water surface profile by graphical, numerical and analytical approaches. Direct Step method, Graphical Integration method and direct integration method.

Module 8: Hydraulic Jump- Theory of hydraulic jump, Elements and characteristics of hydraulic jump in a rectangular Channel, length and height of jump, location of jump, Types, applications and location of hydraulic jump. Energy dissipation and other uses, surge as a moving hydraulic jump. Positive and negative surges. Dynamics of Fluid Flow-Momentum principle, applications: Force on plates, pipe bends, moments of momentum equation,

Module 9: 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.

Module 10: Computational Fluid Dynamics: Basic equations of fluid dynamics, Grid generation, Introduction to in viscid incompressible flow, Boundary layer flow as applicable to C.F.D. Hydro informatics: Concept of hydro informatics –scope of internet and web based modeling in water resources engineering.

Suggested Reading:

1. *Hydraulics and Fluid Mechanics, P.M. Modi and S.M. Seth, Standard Book House*
2. *Theory and Applications of Fluid Mechanics, K. Subramanya, Tata McGraw Hill.*
3. *Open channel Flow, K. Subramanya, Tata McGraw Hill.*
4. *Open Channel Hydraulics, Ven Te Chow, Tata McGraw Hill.*
5. *Burnside, C.D., "Electromagnetic Distance Measurement," Beekman Publishers, 1971.*

Program: - B. Tech
Semester: - Five
Course Code – 5APCCCE302P
Course: Hydraulic Engineering lab

L	T	P	C
0	0	2	1

List of experiments

Practical Work:

1. Flow Visualization
2. Studies in Wind Tunnel
3. Boundary Layer
4. Flow around an Aerofoil / circular cylinder
5. Uniform Flow
6. Velocity Distribution in Open channel flow
7. Venturi Flume
8. Standing Wave Flume
9. Gradually Varied Flow
10. Hydraulic Jump
11. Flow under Sluice Gate
12. Flow through pipes
13. Turbulent flow through pipes
14. Flow visualization
15. Laminar flow through pipes
16. Major losses / Minor losses in pipe

Program: - B. Tech
Semester: - Five
Course Code – 5APCCCE303P
Course: Structural Engineering

L	T	P	C
3	0	0	3

Objectives:

- The students will be able to apply their knowledge of structural mechanics in addressing design problems of structural engineering
- They will possess the skills to solve problems dealing with different loads and concrete and steel
- They will have knowledge in structural engineering

Module 1: Introduction- concepts of energy principles, safety, sustainable development in performance; what makes a structure; principles of stability, equilibrium; what is a structural engineer, role of engineer, architect, user, builder; what are the functions' what do the engineers design, first principles of process of design

Module 2: Planning and Design Process; Materials, Loads, and Design Safety; Behavior and Properties of Concrete and Steel; Wind and Earthquake Loads

Module 3: *Materials and Structural Design Criteria:* Introduction to the analysis and design of structural systems. Analyses of determinate and indeterminate trusses, beams, and frames, and design philosophies for structural engineering. Laboratory experiments dealing with the analysis of determinate and indeterminate structures;

Module 4: *Design of Structural Elements;* Concrete Elements, Steel Elements, Structural Joints; Theories and concepts of both concrete and steel design and analysis both at the element and system levels. Approximate Analysis Methods as a Basis for Design; Design of Reinforced Concrete Beams for Flexure; Design of Reinforced Concrete Beams for Shear; Bond, Anchorage, and Serviceability; Reinforced Concrete Columns; Reinforced Concrete Slabs; Introduction to Steel Design; Tension Members and Connections; Bending Members; Structural Systems

Module 5: *System Design Concepts;* Special Topics that may be Covered as Part of the Design Project Discussions; Cable Structures; Prestressed Concrete Bridges; Constructability and Structural Control; Fire Protection

Suggested Reading:

1. *Nilson, A. H. Design of Concrete Structures. 13th edition. McGraw Hill, 2004*
2. *McCormac, J.C., Nelson, J.K. Jr., Structural Steel Design. 3rd edition. Prentice Hall, N.J., 2003.*
3. *Galambos, T.V., Lin, F.J., Johnston, B.G., Basic Steel Design with LRFD, Prentice Hall, 1996*
4. *Segui, W. T., LRFD Steel Design, 2nd Ed., PWS Publishing, Boston.*
5. *Salmon, C.G. and Johnson, J.E., Steel Structures: Design and Behavior, 3rd Edition, Harper & Row, Publishers, New York, 1990.*
6. *MacGregor, J. G., Reinforced Concrete: Mechanics and Design, 3rd Edition, Prentice Hall, New Jersey, 1997.*
7. *Nawy, E. G., Reinforced Concrete: A Fundamental Approach, 5th Edition, Prentice Hall, New Jersey.*
8. *Wang C-K. and Salmon, C. G., Reinforced Concrete Design, 6th Edition, Addison Wesley, New York.*
9. *Nawy, E. G. Prestressed Concrete: A Fundamental Approach, Prentice Hall, NJ, (2003).*
10. *Related Codes of Practice of BIS*
11. *Smith, J. C., Structural Analysis, Harpor and Row, Publishers, New York.*
12. *W. McGuire, R. H. Gallagher and R. D. Ziemian. "Matrix Structural Analysis", 2nd Edition, John Wiley and Sons, 2000.*
13. *NBC, National Building Code, BIS (2017).*
14. *ASCE, Minimum Design Loads for Buildings and Other Structures, ASCE 7-02, American Society of Civil Engineers, Virginia, 2002.*

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Program: - B. Tech
Semester: - Five
Course Code – 5APCCCE304
Course: Geotechnical Engineering

L	T	P	C
2	0	2	2

Module 1: *Introduction*–Types of soils, their formation and deposition, Definitions: soil mechanics, soil engineering, rock mechanics, geotechnical engineering. Scope of soil engineering. Comparison and difference between soil and rock. Basic Definitions and Relationships-Soil as three-phase system in terms of weight, volume, voids ratio, and porosity. Definitions: moisture content, unit weights, degree of saturation, voids ratio, Porosity, specific gravity, mass specific gravity, etc. Relationship between volume weight, voids ratio- moisture content, unit weight- percent air voids, saturation- moisture content, moisture content- specific gravity etc. Determination of various parameters such as: Moisture content by oven dry method, pycnometer, sand bath method, torsional balance method, nuclear method, alcohol method and sensors. Specific gravity by density bottle method, pycnometer method, measuring flask method. Unit weight by water displacement method, submerged weight method, core-cutter method, sand-replacement method.

On completion of this module, the students must be able to:

- Understand the different types of soil based on their formation mechanism;
- Understand the various phase diagrams and derive various phase relationships of the soil;
- Perform various laboratory experiments to determine moisture content, specific gravity;
- Perform field experiments to estimate the field density of the soil mass.

Module 2: *Plasticity Characteristics of Soil* - Introduction to definitions of: plasticity of soil, consistency limits-liquid limit, plastic limit, shrinkage limit, plasticity, liquidity and consistency indices, flow & toughness indices, definitions of activity and sensitivity. Determination of: liquid limit, plastic limit and shrinkage limit. Use of consistency limits. Classification of Soils-Introduction of soil classification: particle size classification, textural classification, unified soil classification system, Indian standard soil classification system. Identification: field identification of soils, general characteristics of soil in different groups.

On completion of this module, the students must be able to:

- Understand the behavior of soils based on their moisture contents;
- Perform laboratory experiments to estimate various Atterberg’s limits and evaluate index properties of soils;
- Classify any soils based on their particle size distribution and index properties;

Module 3: *Permeability of Soil* - Darcy's law, validity of Darcy's law. Determination of coefficient of permeability: Laboratory method: constant-head method, falling-head method. Field method: pumping- in test, pumping- out test. Permeability aspects: permeability of stratified soils, factors affecting permeability of soil. Seepage Analysis- Introduction, stream and potential functions, characteristics of flow nets, graphical method to plot flow nets.

On completion of this module, the student must be able to:

- Determine the permeability of soils through various laboratory and field tests;
- Analytically calculate the effective permeability of anisotropic soil mass;
- Determine the seepage quantities and pore water pressures below the ground;
- Graphically plot the equipotential lines and flow lines in a seepage flow.

Module 4: *Effective Stress Principle* - Introduction, effective stress principle, nature of Effective stress, effect of water table. Fluctuations of effective stress, effective stress in soils saturated by capillary action, seepage pressure, quick sand condition.

On completion of this module, the student must be able to:

- Understand the physical significance of effective stress and its relation with pore pressure;
- Plot various stress distribution diagrams along the depth of the soil mass;
- Understand the effect of capillary action and seepage flow direction on the effective stress at a point in the soil mass.

Module 5: *Compaction of Soil*-Introduction, theory of compaction, laboratory determination of optimum moisture content and maximum dry density. Compaction in field, compaction specifications and field control.

On completion of this module, the student must be able to:

- Perform laboratory test to determine the maximum dry density and optimum moisture content of the soil; Variation in compaction curve with compaction effort and soil type;
- Determine the compactive effort required to obtain necessary degree of compaction in-situ; Differentiate among various field methods of compaction and their usage based on the type of soil.

Module 6: *Stresses in soils* – Introduction, stresses due to point load, line load, strip load, uniformly loaded circular area, rectangular loaded area. Influence factors, Isobars, Boussinesq's equation, Newmark's Influence Chart. Contact pressure under rigid and flexible area, computation of displacements from elastic theory.

On completion of this module, the student must be able to:

- Analytically compute the vertical stress in a semi-infinite soil mass due to various
- loading conditions;
- Plot isobars due various loading conditions.

Module 7: *Consolidation of Soil* - Introduction, comparison between compaction and consolidation, initial, primary & secondary consolidation, spring analogy for primary

consolidation, interpretation of consolidation test results, Terzaghi's theory of consolidation, final settlement of soil deposits, computation of consolidation settlement and secondary consolidation.

On completion of this module, the student must be able to:

- Understand the basic mechanism of consolidation of soil;
- Determine various consolidation parameters of soil through laboratory test;
- Evaluate ground settlements against time.

Module 8: *Shear Strength* - Mohr circle and its characteristics, principal planes, relation between major and minor principal stresses,Mohr-Coulomb theory, types of shear tests: direct shear test, merits of direct shear test, triaxial compression tests, test behaviour of UU, CU and CD tests, pore-pressure measurement, computation of effective shear strength Parameters unconfined compression test, vane shear test on completion of this module, the student must be able to:

- Determine graphically and analytically the stress state in any plane of the soil mass;
- Perform various shear strength tests and appreciate the different field conditions
- which they simulate;
- Understand the significance of shear strength parameters in various geotechnical
- analyses;
- Evaluate the stiffness of soil using shear strength parameters

Module 9: *Stability of Slopes* - Introduction, types of slopes and their failure mechanisms, Factor of safety, analysis of finite and infinite slopes, wedge failure Swedish circle method, Friction circle method, stability numbers and charts. On completion of this module, the student must be able to: Differentiate various modes of slope failure; Evaluate factor of safety of infinite slopes based on different ground conditions; Understand various methods for computation of factor of safety for finite slopes.

Module 10: *Soil Exploration*- Introduction, methods of site exploration and soil investigation, Methods of boring, soil samples, sampling procedures, trail pits, borings, penetrometer tests, Analysis of borehole logs, geophysical and advance soil exploration methods.

Suggested Reading:

1. *Soil Mechanics by Craig R.F., Chapman & Hall*
2. Fundamentals of Soil Engineering by Taylor, John Wiley & Sons
3. An Introduction to Geotechnical Engineering, by Holtz R.D. and Kovacs, W.D., Prentice Hall, NJ
4. Principles of Geotechnical Engineering, by Braja M. Das, Cengage Learning
5. Principles of Foundation Engineering, by Braja M. Das, Cengage Learning
6. Essentials of Soil Mechanics and Foundations: Basic Geotechnics by David F. McCarthy
7. Soil Mechanics in Engineering Practice by Karl Terzaghi, Ralph B. Peck, and Gholamreza Mesri.
8. Geotechnical Engineering: Principles and Practices of Soil Mechanics and Foundation Engineering (Civil and Environmental Engineering) by V.N.S. Murthy

Program: - B. Tech
Semester: - Five
Course Code – 5APCCCE304P
Course: Geotechnical Engineering lab

L	T	P	C
0	0	2	1

List of experiments:-

Practical Work: List of tests on-

1. Field Density using Core Cutter method.
2. Field Density using Sand replacement method.
3. Natural moisture content using Oven Drying method.
4. Field identification of Fine Grained soils.
5. Specific gravity of Soils.
6. Grain size distribution by Sieve Analysis.
7. Grain size distribution by Hydrometer Analysis.
8. Consistency limits by Liquid limit
9. Consistency limits by Plastic limit
10. Consistency limits by Shrinkage limit.
11. Permeability test using Constant-head test method.
12. Permeability test using Falling-head method.
13. Compaction test: Standard Proctor test.
14. Compaction test: Modified Proctor test.
15. Relative density.
16. Consolidation Test.
17. Triaxial Test (UU)
18. Vane shear test
19. Direct Shear Test
20. Unconfined Compression Strength Test

Program: - B. Tech
Semester: - Five
Course Code – 5APCCCE305
Course: Hydrology and Water Resources Engineering

L	T	P	C
2	2	0	3

Objectives

- At the end of the course, students must be in a position to:
- Understand the interaction among various processes in the hydrologic cycle
- Apply the application of fluid mechanics and use of computers in solving a host of problems in hydraulic engineering
- Study types and classes of hydrologic simulation models and design procedures for safe and effective passage of flood flows for design of hydraulic structures
- Understand the basic aquifer parameters and estimate groundwater resources for different hydro-geological boundary conditions

Module 1: *Introduction* - hydrologic cycle, water-budget equation, history of hydrology, world water balance, applications in engineering, sources of data.

Module 2: *Precipitation* - forms of precipitation, characteristics of precipitation in India, measurement of precipitation, rain gauge network, mean precipitation over an area, depth-area-duration relationships, maximum intensity/depth-duration-frequency relationship, Probable Maximum Precipitation (PMP), rainfall data in India.

Module 3:*Abstractions from precipitation* - evaporation process, evaporimeters, analytical methods of evaporation estimation, reservoir evaporation and methods for its reduction, evapotranspiration, measurement of evapotranspiration equations, potential evapotranspiration over India, actual evapotranspiration, interception, depression storage, infiltration, infiltration capacity, measurement of infiltration, modeling infiltration capacity, classification of infiltration capacities, infiltration indices.

Module 4:*Runoff* - runoff volume, SCS-CN method of estimating runoff volume, flow-duration curve, flow-mass curve, hydrograph, factors affecting runoff hydrograph, components of hydrograph, base flow separation, effective rainfall, unit hydrograph surface water resources of India, environmental flows.

Module 5: *Ground water and well hydrology* - forms of subsurface water, saturated

Formation, aquifer properties, geologic formations of aquifers, well hydraulics: steady state flow in wells, equilibrium equations for confined and unconfined aquifers, aquifer tests.

Module 6: *Water withdrawals and uses* – water for energy production, water for agriculture, water for hydroelectric generation; flood control. Analysis of surface water supply, Water requirement of crops-Crops and crop seasons in India, cropping pattern, duty and delta; Quality of irrigation water; Soil-water relationships, root zone soil water, infiltration, consumptive use, irrigation requirement, frequency of irrigation; Methods of applying water to the fields: surface, sub-surface, sprinkler and trickle / drip irrigation.

Module 7: *Distribution systems* - canal systems, alignment of canals, canal losses, estimation of design discharge. Design of channels- rigid boundary channels, alluvial channels, Kennedy's and Lacey's theory of regime channels. Canal outlets: non-modular, semi-modular and modular outlets. Water logging: causes, effects and remedial measures. Lining of canals, types of lining. Drainage of irrigated lands: necessity, methods.

Module 8: *Dams and spillways* - embankment dams: Classification, design considerations, estimation and control of seepage, slope protection. Gravity dams: forces on gravity dams, causes of failure, stress analysis, elementary and practical profile. Arch and buttress dams. Spillways: components of spillways, types of gates for spillway crests; Reservoirs- Types, capacity of reservoirs, yield of reservoir, reservoir regulation, sedimentation, economic height of dam, selection of suitable site.

Suggested Reading:

1. *K Subramanya, Engineering Hydrology, Mc-Graw Hill.*
2. *K N Muthreja, Applied Hydrology, Tata Mc-Graw Hill.*
3. *K Subramanya, Water Resources Engineering through Objective Questions, Tata Mc-Graw Hill.*
4. *G L Asawa, Irrigation Engineering, Wiley Eastern*
5. *L W Mays, Water Resources Engineering, Wiley.*
6. *J D Zimmerman, Irrigation, John Wiley & Sons*
7. *C S P Ojha, R Berndtsson and P Bhunya, Engineering Hydrology, Oxford.*

Program: - B. Tech
Semester: - Five
Course Code – 5APCCCE306
Course: Environmental Engineering

L	T	P	C
2	0	2	2

Objectives

- After successfully studying this course, students will
- Understand the impact of humans on environment and environment on humans
- Be able to identify and value the effect of the pollutants on the environment: atmosphere, water and soil.
- Be able to plan strategies to control, reduce and monitor pollution.
- Be able to select the most appropriate technique for the treatment of water, wastewater solid waste and contaminated air.

Module 1: *Water:* -Sources of Water and quality issues, water quality requirement for different beneficial uses, Water quality standards, water quality indices, water safety plans, Water Supply systems, Need for planned water supply schemes, Water demand industrial and agricultural water requirements, Components of water supply system; Transmission of water, Distribution system, Various valves used in W/S systems, service reservoirs and design. *Water Treatment:* aeration, sedimentation, coagulation flocculation, filtration, disinfection, advanced treatments like adsorption, ion exchange, membrane processes

Module 2: *Sewage*- Domestic and Storm water, Quantity of Sewage, Sewage flow variations. Conveyance of sewage- Sewers, shapes design parameters, operation and maintenance of sewers, Sewage pumping; Sewerage, Sewer appurtenances, Design of sewerage systems. Small bore systems, Storm Water- Quantification and design of Storm water; Sewage and Sullage, Pollution due to improper disposal of sewage, National River cleaning plans, Wastewater treatment, aerobic and anaerobic treatment systems, suspended and attached growth systems, recycling of sewage – quality requirements for various purposes.

Module 3: *Air* - Composition and properties of air, Quantification of air pollutants, Monitoring of air pollutants, Air pollution- Occupational hazards, Urban air pollution automobile pollution, Chemistry of combustion, Automobile engines, quality of fuel, operating conditions and interrelationship. Air quality standards, Control measures for Air pollution, construction and limitations

Module 4: *Noise*- Basic concept, measurement and various control methods.

Module5: *Solid waste management*-Municipal solid waste, Composition and various chemical and physical parameters of MSW, MSW management: Collection, transport, treatment and disposal of MSW. Special MSW: waste from commercial establishments and other urban areas, solid waste from construction activities, biomedical wastes, Effects of solid waste on

environment: effects on air, soil, water surface and ground health hazards. Disposal of solid waste-segregation, reduction at source, recovery and recycle. Disposal methods-Integrated solid waste management. Hazardous waste: Types and nature of hazardous waste as per the HW Schedules of regulating authorities.

Module 6: *Building Plumbing*-Introduction to various types of home plumbing systems for water supply and waste water disposal, high rise building plumbing, Pressure reducing valves, Break pressure tanks, Storage tanks, Building drainage for high rise buildings, various kinds of fixtures and fittings used.

Module 7: Government authorities and their roles in water supply, sewerage disposal. Solid waste management and monitoring/control of environmental pollution.

Suggested Reading:

1. *Introduction to Environmental Engineering and Science by Gilbert Masters, Prentice Hall, New Jersey.*
2. *Introduction to Environmental Engineering by P. Aarne Vesilind, Susan M. Morgan, Thompson /Brooks/Cole; Second Edition 2008.*
3. *Peavey, H.s, Rowe, D.R, Tchobanoglous, G. Environmental Engineering, Mc-Graw - Hill International Editions, New York 1985.*
4. *MetCalf and Eddy. Wastewater Engineering, Treatment, Disposal and Reuse, Tata McGraw-Hill, New Delhi.*
5. *Manual on Water Supply and Treatment. Ministry of Urban Development, New Delhi.*
6. *Plumbing Engineering. Theory, Design and Practice, S.M. Patil, 1999*
7. *Integrated Solid Waste Management, Tchobanoglous, Theissen & Vigil. McGraw Hill Publication*
8. *Manual on Sewerage and Sewage Treatment Systems, Part A, B and C. Central Public Health and Environmental Engineering Organization, Ministry of Urban Development*

Program: - B. Tech
Semester: - Five
Course Code – 5APCCCE306P
Course: Environmental Engineering lab

L	T	P	C
0	0	2	1

Practical Work: List of Experiments

1. Physical Characterization of water: Turbidity, Electrical Conductivity, pH
2. Analysis of solids content of water: Dissolved, Settle able, suspended, total, volatile, Inorganic etc.
3. Alkalinity and acidity, Hardness: total hardness, calcium and magnesium hardness
4. Analysis of ions: copper, chloride and sulfate
5. Optimum coagulant dose
6. Chemical Oxygen Demand (COD)
7. Dissolved Oxygen (D.O) and Biochemical Oxygen Demand (BOD)
8. Break point Chlorination
9. Bacteriological quality measurement: MPN,
10. Ambient Air quality monitoring (TSP, RSPM, SOx, NOx)
11. Ambient noise measurement

Program: - B. Tech
Semester: - Five
Course Code – 5APCCCE307
Course: Transportation Engineering

L	T	P	C
2	0	2	2

Objectives:

- carry out surveys involved in planning and highway alignment
- design the geometric elements of highways and expressways
- carry out traffic studies and implement traffic regulation and control measures and
- intersection design
- characterize pavement materials and
- design flexible and rigid pavements as per IRC

Module 1: Highway development and planning-Classification of roads, road development in India, Current road projects in India; highway alignment and project preparation.

Module 2: Geometric design of highways-: Introduction; highway cross section elements; sight distance, design of horizontal alignment; design of vertical alignment; design of intersections, problems

Module 3:Traffic engineering & control- Traffic Characteristics, traffic engineering studies, traffic flow and capacity, traffic regulation and control; design of road intersections; design of parking facilities; highway lighting; problems

Module 4: Pavement materials- Materials used in Highway Construction- Soils, Stone aggregates, bituminous binders, bituminous paving mixes; Portland cement and cement concrete: desirable properties, tests, requirements for different types of pavements. Problems

Module 5: Design of pavements- Introduction; flexible pavements, factors affecting design and performance; stresses in flexible pavements; design of flexible pavements as per IRC; rigid pavements- components and functions; factors affecting design and performance of CC pavements; stresses in rigid pavements; design of concrete pavements as per IRC; problems

Suggested Reading:

1. *Khanna, S.K., Justo, C.E.G and Veeraragavan, A, 'Highway Engineering', Revised 10th Edition, Nem Chand & Bros, 2017*
2. *Kadiyalai, L.R., ' Traffic Engineering and Transport Planning', Khanna Publishers.*
3. *Partha Chakraborty', ' Principles Of Transportation Engineering, PHI Learning,*
4. *Fred L. Mannering, Scott S. Washburn, Walter P. Kilareski,'Principles of Highway Engineering and Traffic Analysis', 4th Edition, John Wiley*
5. *Srinivasa Kumar, R, Textbook of Highway Engineering, Universities Press, 2011.*
6. *Paul H. Wright and Karen K. Dixon, Highway Engineering, 7th Edition, Wiley Student Edition, 2009.*

Program: - B. Tech
Semester: - Five
Course Code – 5APCCCE307P
Course: Transportation Engineering Lab

L	T	P	C
0	0	2	1

Objectives:

Program: - B. Tech
Semester: - Five
Course Cod:-HSMC301
Course: Professional Skills

L	T	P	C
2	0	0	0

COURSE OBJECTIVE-The aim is to develop students' soft skills, communication, leadership and teamwork skills; and personal development skills using practical approach and exposure of students to the realities of the world.

- To enhance Leadership – assessing the requirements of a task, identifying the strengths/weaknesses within the team, utilising the diverse skills of the group to achieve the set objectives.
- To improve Communication – demonstrating clear briefing and listening /speaking skills.
- To make them realize that effective communication and interpersonal skills are crucial to increase employment opportunities and to compete successfully in the business environment.
- The course aims to cause a basic awareness about the significance of soft skills in professional and inter-personal communications and facilitate an all-round development of personality. Hard or technical skills help securing a basic position in one's life and career. But only soft skills can ensure a person retain it, climb

Module 1: Personal Development

Managing Self - Self Discovery, Self Awareness, Self Esteem, Self Responsibility, Self Management Personal Development Skills, Categories of Personal Development, Personal Development Process Relationship Management - Managing Others, Interpersonal Skills, Improving Relationship, Transactional Analysis, JOHARI Window, four Life Positions

Module 2: Thinking Process

Strategic Thinking – Introduction, Concept, Stages in Strategic Thinking, Process of Strategic Thinking, Importance of Strategic Thinking, Characteristics of Strategic Thinkers, Developing Strategic Thinking

Lateral Thinking – Introduction, Meaning, Need for Lateral Thinking, Techniques of Lateral Thinking, Benefits of Lateral Thinking

Creative Thinking – Out of Box Thinking, Application of Thinking

Facing Changes – Adapting Change, Understanding Change- Examples of Organizational Change Facing Challenges – Introduction, Taking Initiative, Benefits of facing challenges, facing challenges in life Balancing Work and Life – Importance, Gender differences regarding work life balance, Tips for balancing work and life

Module 3: Individual Behaviour

Attitude – Components of Attitude, Factors influencing Attitude, Types of Attitude, Challenges and lessons from Attitude, Impact of Attitude on Behaviour Motivation – Concept, Objective, Factors of Motivation, Self Steem, Intrinsic & Extrinsic Motivation

Time Management – Value of Time, Diagnosing Time management, Weekly Planner, To Do List, Prioritizing Work Stress Management – Introduction, Difference between Stress, Anxiety

and Tension, Managing Stress Applied Ethics – Introducing Professional Ethics, Ethical Dilemma

Module 4: Employment Communication

Job Communication – Developing Job Communication Skills, Job Communication Process, Developing Confidence
Job Search Strategy – Understanding the Job Market, The Job Search Process, Job Search Techniques Job Application, Employment Letters
Resume Building – Difference between Bio data, Curriculum Vitae and ResumeThe Job Interview - Types of Job Interview, Preparing for a Job Interview, Understanding Interview Questions, Handling Interview Questions, Interview Strategies
Psychometric Test

Suggested Readings:

1. Covey S (2004) the 7 Habits of Highly Effective People.
2. Goud, N. & Arkoff, A. (2003) Psychology and Personal Growth, Allyn & Bacon.
3. Sen, Leena, Communication Skills, Eastern Economy Edition
4. Dr. K.Alex Managerial Skills, S.Chand

Program: B.Tech
Semester: Five
Course: Constitution of India
Course Code: MC301

L	T	P	C
2	0	0	0

Course Objective: The basic object of the course is to provide the acquaintance with the basic features of Indian Constitution e.g. Fundamental Rights, Fundamental Duties and Directive Principles of State policy Further it is aimed to impart the knowledge about Judicial system in India.

Module 1 (4 Hours)

1. Nature of Indian Constitution
2. Preamble
3. Union and its Territory (Arts 1-4)
4. Citizenship (Arts 5-11)
5. Definition of State (Art 12)

Module 2 (6 Hours)

1. Judicial Review (Article 13)
2. Right to Equality (Article 14)
3. Prohibition on grounds of Religion, Race, Caste, Sex, Place of Birth (Article 15)
4. Equality of Opportunity in Public Employment (Article 16)
5. Abolition of Untouchability and Titles (Articles 17-18)

Module 3 (6 Hours)

1. Basic freedoms (Article 19)
2. Protection in respect of conviction for offences (Article 20)
3. Right to Life and Personal Liberty (Article 21)
4. Safeguards against arbitrary arrest and detention (Article 22)

Module 4 (6 Hours)

- Right against exploitation (Articles 23-24)
- Freedom of Religion (Articles 25-28)
- Cultural and Educational Rights of Minorities (Articles 29-30)
- Constitutional Remedies (Articles 32-35)

Module 5 (8 Hours)

1. Directive Principles of State Policy and their relation with Fundamental Rights (Articles 36-51)
2. Fundamental Duties (Article 51-A)
3 Right to Property (Article 300-A)
4 Facts and Law laid down in Maneka Gandhi V Union of India AIR 1978 SC597

5 Facts and Law laid down in Indira Sawhney V Union of India AIR 1993 SC 477

Suggested Reading:

1. *Austin Granville- The Indian constitution: Cornerstone of a Nation.*
2. *Seervai H.M. - Constitution of India*
3. *Jain M.P. – Indian Constitutional Law*
4. *Shukla V N- Constitution of India (ed. By M.P. Singh)*
5. *Basu D.D. – Shorter Constitution of India*

Program: B.Tech
Semester: Five
Course: Civil Engineering -Social & Global Impact
Course Code: 5AHSMC302

L	T	P	C
2	0	0	2

Course Objective:

- Awareness of the importance of Civil Engineering and the impact it has on the Society and at global levels
- Awareness of the impact of Civil Engineering for the various specific fields of human endeavour
- Need to think innovatively to ensure Sustainability
-

Module 1

Introduction to Course and Overview; Understanding the past to look into the Future: Pre-industrial revolution days, Agricultural revolution, first and second industrial Revolutions, IT revolution; recent major Civil Engineering breakthroughs and innovations; Present day world and future projections, Ecosystems in Society and in Nature; the steady Erosion in Sustainability; Global warming, its impact and possible causes; evaluating future Requirements for various resources; GIS and applications for monitoring systems; Human Development Index and Ecological Footprint of India Vs other countries and analysis;

Module 2

Understanding the importance of Civil Engineering in shaping and impacting the World; The ancient and modern Marvels and Wonders in the field of Civil Engineering; Future Vision for Civil Engineering

Module 3

Infrastructure - Habitats, Megacities, Smart Cities, futuristic visions; Transportation (Roads, Railways & Metros, Airports, Seaports, River ways, Sea canals, Tunnels (below ground, under water); Futuristic systems (ex, Hyper Loop)); Energy Generation (Hydro, Solar (Photovoltaic, Solar Chimney), Wind, Wave, Tidal, Geothermal, Thermal energy); Water provisioning; Telecommunication needs (towers, above-ground and Underground cabling); Awareness of various Codes & Standards governing Infrastructure development; Innovations and methodologies for ensuring Sustainability;

Module 4

Environment- Traditional & futuristic methods; Solid waste management, Water Purification, Wastewater treatment & Recycling, Hazardous waste treatment; Flood control (Dams, Canals, River interlinking), Multi-purpose water projects, Atmospheric pollution; Global warming phenomena and Pollution Mitigation measures, Stationarity and nonstationarity; Environmental Metrics & Monitoring; Other Sustainability measures; Innovations and methodologies for ensuring Sustainability.

Module 5

Built environment – Facilities management, Climate control; Energy efficient Built environments and LEED ratings, Recycling, Temperature/ Sound control in builtvb Environment, Security systems; Intelligent/ Smart Buildings; Aesthetics of built environment, Role of Urban Arts Commissions; Conservation, Repairs & Rehabilitation of Structures & Heritage structures; Innovations and methodologies for ensuring Sustainability

Module 6

Civil Engineering Projects – Environmental Impact Analysis procedures; Waste (Materials, manpower, equipment) avoidance/ Efficiency increase; Advanced construction Techniques for better sustainability; Techniques for reduction of Green House Gas emissions In various aspects of Civil Engineering Projects; New Project Management paradigms & nSystems (Ex. Lean Construction), contribution of Civil Engineering to GDP, Contribution to Employment (projects, facilities management), Quality of products, Health & Safety aspects for stakeholders; Innovations and methodologies for ensuring Sustainability during Project Development.

Suggested Reading:

1. Žiga Turk (2014), Global Challenges and the Role of Civil Engineering, Chapter 3 in: Fischinger M. (eds) Performance-Based Seismic Engineering: Vision for anEarthquake Resilient Society. Geotechnical, Geological and Earthquake Engineering,Vol. 32. Springer, Dordrecht

2. Brito, Ciampi, Vasconcelos, Amarol, Barros (2013) Engineering impacting Social, Economical and Working Environment, 120th ASEE Annual Conference and Exposition

3. NAE Grand Challenges for Engineering (2006), Engineering for the DevelopingWorld, The Bridge, Vol 34, No.2, Summer 2004.

4. Allen M. (2008) Cleansing the city. Ohio University Press. Athens Ohio.

5. Ashley R., Stovin V., Moore S., Hurley L., Lewis L., Saul A. (2010). London Tideway Tunnels Programme – Thames Tunnel Project Needs Report – Potential source control and SUDS applications: Land use and retrofit options

6. http://www.thamestunnelconsultation.co.uk/consultation-documents.aspx

7. Ashley R M., Nowell R., Gersonius B., Walker L. (2011). Surface Water Management and Urban Green Infrastructure. Review of Current Knowledge. Foundation for Water Research FR/R0014

8. Barry M. (2003) Corporate social responsibility – unworkable paradox or sustainable paradigm? Proc ICE Engineering Sustainability 156. Sept Issue ES3 paper 13550. P 129-130

9. Blackmore J M., Plant R A J. (2008). Risk and resilience to enhance sustainability with application to urban water systems. J. Water Resources Planning and Management. ASCE. Vol. 134, No. 3, May.

10. Bogle D. (2010) UK's engineering Council guidance on sustainability. Proc ICE Engineering Sustainability 163. June Issue ES2 p61-63

11. Brown R R., Ashley R M., Farrelly M. (2011). Political and Professional Agency Entrapment: An Agenda for Urban Water Research. Water Resources Management. Vol. 23, No.4. European Water Resources Association (EWRA) ISSN 0920-4741.