Semester III (Second Year): Branch /Course Civil Engineering

S1. No.	Category	Code	Course Title	Hours per week			Total contact hours	Credits
				Lecture	Tutorial	Practical		
1	Basic Science Course	BSC-CE301	Mathematics-III (Transform & Discrete Mathematics)	3	0	0	3	3
2	Engineering Science Course	ESC-CE302	Engineering Mechanics	3	1	0	4	4
3	Professional Core Course	PCC-CE303	Surveying & Geomatics	3	1	0	4	3
4	Professional Core Course	PCC-CE304	Geotechnical Engineering	3	1	0	4	3
5	Professional Core Course	PCC-CE305	Fluid Mechanics I	3	1	0	4	3
Lab								
1	Engineering Science Course	ESC-CE306	Engineering Mechanics	--	--	2	2	1
2	Professional Core Course	PCC-CE307	Fluid Mechanics I	--	--	2	2	1
3	Professional Core Course	PCC-CE308	Surveying & Geomatics	--	--	3	3	1
4	Professional Core Course	PCC-CE309	Geotechnical Engineering	--	--	2	2	1
5	Mandatory Course	MC-CE310	Environmental Science	--	--	2	2	0
							Total Credit	**20**

Semester IV (Second Year) Branch /Course Civil Engineering

S1. No.	Category	Code	Course Title	Hours per week			Total contact hours	Credits
				Lecture	Tutorial	Practical		
1	Professional Core Course	PCC-CE401	Building Construction	3	0	0	3	2
2	Professional Core Course	PCC-CE402	Concrete Technology	3	1	0	4	3
3	Professional Core Course	PCC-CE403	Engineering Geology	3	0	0	3	2
4	Professional Core Course	PCC-CE404	Strength of Materials	3	1	0	4	4
5	Professional Core Course	PCC-CE405	Environmental Engineering	3	0	0	3	3
6	Professional Core Course	PCC-CE406	Hydrology and water resources	3	0	0	3	2
Lab								
1	Engineering Science Course	ESC-CE407	Computer-aided Civil Engineering Drawing	--	--	2	2	1
2	Professional Core Course	PCC-CE408	Concrete Technology	--	--	2	2	1
3	Professional Core Course	PCC-CE409	Strength of Materials	--	--	2	2	1
4	Professional Core Course	PCC-CE410	Environmental Engineering	--	--	2	2	1
							Total Credit	**20**

Semester V (Third Year): Branch /Course Civil Engineering

S1. No.	Category	Code	Course Title	Hours per week			Total contact hours	Credits
				Lecture	Tutorial	Practical		
1	Professional Elective Course	PEC- 1	Construction Project Planning and System (old BDD)/ Infrastructural Planning and Design	3	1	0	4	3
2	Open Elective Course	OEC- 1	Human Resource Development and organizational Behavior / Economic Policies In India/ Comparative Studies of Literature	3	1	0	4	2
3	Professional Core Course	PCC- 1	Transportation Engineering	3	1	0	4	3
4	Professional Core Course	PCC- 2	Structural Analysis I	3	1	0	4	3
5	Professional Core Course	PCC- 3	Survey II	3	0	0	3	3
6	Professional Core Course	PCC- 4	RCC	3	1	0	4	4
Lab								
1	Professional Elective Course	PCC	Construction Project Planning and System (old BDD)/ Infrastructural Planning and Design	--	--		2	1
2	Professional Core Course	PCC	Survey II	--	--		2	1
							Total Credit	**20**

Semester VI (Third Year) Branch /Course Civil Engineering

S1. No.	Category	Code	Course Title	Hours per week			Total contact hours	Credits
				Lecture	Tutorial	Practical		
1	Professional Elective Course	PEC- 2	Pavement Design/ Pavement Material	3	1	0	4	4
2	Open Elective Course	OEC-2	Metro System and Engineering/ Introduction to Art and Aesthetics	3	0	0	3	3
3	Basic Science Course	BCS- 1	Civil Engineering Societal and Global Impact	3	0	0	3	2
4	Professional Core Course	PCC- 1	SA II	3	1	0	4	4
5	Professional Core Course	PCC- 2	DSS	3	1	0	4	4
Lab								
1	Professional Core Course	PCC-1	SA II	--	--	2	2	1
2	Professional Core Course	PCC-2	DSS	--	--	2	2	1
3	Professional Core Course	PCC-3	Civil Engineering Case Study	--	--	2	2	1
							Total Credit	**20**

Semester IV (Second Year)

Branch /Course Mechanical Engineering

S1. No.	Category	Code	Course Title	Hours per week			Total contact hours	Credits
				Lecture	Tutorial	Practical		
1	Professional Core Course	PCC-ME202	Applied Thermodynamics	3	1	0	4	4
2	Professional Core Course	PCC-ME203	Fluid Machines	3	1	0	4	4
3	Professional Core Course	PCC-ME204	Strength of Materials	3	1	0	4	4
4	Professional Core Course	PCC-ME206	Instrumentation and Control	3	1	0	4	4
5	Professional Core Course	PCC-ME207	Machine Drawing	3	0	2	5	4
6	Mandatory Courses	MC-02	Environmental Science	--	--	--	0	0
							Total Credits	20

FACULTY OF SCIENCE AND ENGINEERING

Third Semester B.E. (Civil Engineering)

Course Code: **ESC**
Title of the Course: **Engineering Mechanics Theory : Common for All Branches**

Course Scheme					Evaluation Scheme (Theory)				
Lecture	Tutorial	Practical	Periods/ Week	Credits	Duration of Paper Hr.	MSE	IE	ESE	Total
3	1	0	4	4	3 hrs	10	10	80	100

Unit	CONTENTS	Hours
Unit 1	Basic principles of mechanics, Types of force system, Moment of a force about a point and about an axis, Couple, Equivalent force systems: Resultant of a co-planner and spatial force system. Analytical and graphical methods. Equilibrium of co-planner force system. Applications to beams and frames	9 Hrs
Unit 2	Analysis of structures. Theory and Laws of friction and its application like Cone friction wedges, belt friction and band brakes.	9 Hrs
Unit 3	Centroid of composite areas, Moment of inertia and products of inertia of plane areas, Transfer theorems for moment of inertia and Product of inertia. Mhor's circle method. Principle of Virtual work applied to equilibrium of Mechanisms, simple beam, Pin jointed frames.	9 Hrs
Unit 4	Kinematics of Particles: rectilinear motion, curvilinear motion in Cartesian and polar co-ordinates, Motion of projectiles, Relative motion, Fixed axis rotation.	9 Hrs
Unit 5	Kinetics of particles: D'alembert's principle, equations of motion of particles and rigid bodies. Motion of connected bodies. Principal of work and energy, Principal of Impulse Momentum and their applications to particles. Direct central Impact.	9 Hrs

FACULTY OF SCIENCE AND ENGINEERING

Third Semester B.E. (Civil Engineering)

Course Code: **ESC**
Title of the Course: **Engineering Mechanics Laboratory: Common for All Branches**

Course Scheme				Evaluation Scheme (Laboratory)		
Lecture	Tutorial	Practical	Credits	TW	POE	Total
0	0	2	1	25	25	50

LIST OF EXPERIMENTS : PERFORM ANY 10

1 Study of simple lifting machines
2 Determination mechanical advantage, velocity ratio and efficiency of Differential axel and wheel and verification of law of machine.
3 Determination mechanical advantage, velocity ratio and efficiency of single purchase crab winch and verification of law of machine.
4 Determination mechanical advantage, velocity ratio and efficiency of double purchase crab winch and verification of law of machine.
5 Determination mechanical advantage, velocity ratio and efficiency of worm and worm wheel and verification of law of machine.
6 Determination mechanical advantage, velocity ratio and efficiency of simple screw jack and verification of law of machine.
7 Determination of tensile and compressive forces in Jib-Crane apparatus and verification of Law of triangle.
8 Determination of reactions at the support of simply supported beam.
9 Determination of limiting friction, angle of friction and coefficient of friction between two bodies in contact by friction plane apparatus.
10 Determination of belt or coil friction between two bodies in contact by coil friction apparatus.
11 Determination of mass moment of inertia of Fly Wheel.
12 Determination of value of "acceleration due to gravity" and verification of Newton's Second law of Motion by Fleture's trolly equipment.
13 Graphical Methods:
    1. Determination of resultant.
    2. Determination of support reactions.
    3. Determination of forces in the members of truss by Maxwell's Diagram Method.
    4. Determination of frictional forces.

FACULTY OF SCIENCE AND ENGINEERING

Third Semester B.E. (Civil Engineering)

Course Code: **PCC- 1**
Title of the Course: **Surveying & Geomatics : Theory**

Course Scheme					Evaluation Scheme (Theory)				
Lecture	Tutorial	Practical	Periods/Week	Credits	Duration of Paper Hr.	MSE	IE	ESE	Total
3	1	0	4	3	3 hrs	10	10	80	100

Unit	CONTENTS	Hours
Unit 1	Chain and compass Traversing Introduction, Principles of surveying, chain survey, errors in chaining, ranging, chaining, offsetting, plotting chain survey data, instruments for measuring right angles, use of prismatic compass, bearing of lines, Local attraction, traversing with chain and compass, plotting and adjusting a traverse, Magnetic Declination etc. Plane Table Survey Equipment required for plane table Survey, uses, advantages, disadvantages and errors in plane table surveying; Methods of plane table Survey Radiation, intersection, traversing and resection; Two point and Three point problems and their solutions by different methods, Strength of fix, Lehman's Rules. Study of Dumpy Level and Theodolite Principle axes of Dumpy Level: study of Dumpy Level, testing and adjustment of axis of bubble tube and line of collimation, reciprocal leveling, curvature and refraction corrections, distance to the visible horizon. Study of Vernier and Micro Optic Theodolite: introduction to 20" Vernier Theodolite. Principle axes of Theodolite: Testing and Permanent adjustments of Transit Theodolite.	9 Hrs
Unit 2	Tacheometry Principle of stadia, fixed hair method with vertical staff to determine horizontal distances and elevations of the points. Use of Tacheometry in Surveying, Tacheometric Contour Survey. Ontouringuse of contour maps, direct and indirect methods of contouring. Profile Levelling Longitudinal Section and Crosssections Study and use of Toposheets. Theodolite Traversing Uses of Theodolite: Measurement of Horizontal angles, horizontal angles by repetition and by reiteration (errors eliminated) ,vertical angles, magnetic bearings, prolonging a line, lining in, setting out angles. Theodolite Traversing: Computation of Consecutive and independent Coordinates, adjustment of closed traverse, by transit rule and Bowditch's rule, Gales Traverse table, omitted measurements, area calculation by independent coordinates. Open Traverse – Its uses, measurement of deflection angles using transit Theodolite, open traverse survey, checks in open traverse.	9 Hrs
Unit 3	Geodetic Surveying Objects, Methods in Geodetic surveying, Trilateration, Classification of triangulation systems, Triangulation figures, Strength of figure & derivation for well conditioned triangle, Selection of stations, intervisibility & height of stations, Towers signals & their classifications, Phase of signals & their corrections. Satellite stations, Reduction to center, Reduction to mean sea level and extension of	9 Hrs

	base.	
Unit 4	Photogrammetry Objects, applications to various fields, aerial camera, comparison of map & vertical photograph, vertical tilted and oblique photographs, scale of vertical photograph, Mirror Stereoscope, photo interpretation, etc. Geographic Information System (GIS): definition and meaning, data modes for GIS, components of GIS, and application to Civil Engineering, etc.	9 Hrs
Unit 5	Advance Surveying Techniques Global Positioning System(GPS): Applications to Civil Engineering, concept of Global Positioning Systems [GPS] and differential GPS, Electromagnetic waves and their properties, Electromagnetic Distance Meters (E.D.M.), measurement principle of EDM instruments, Total Station and its uses, fundamental parameters of Total Station, etc., Optical Theodolite, etc. Remote Sensing: basic principles, electromagnetic spectrum, classification of remote sensing systems, etc.	9 Hrs

Text Books:

- Kanetkar T.P. and Kulkarni S.V. "Surveying and Levelling – Part1", Pune Vidyarthi Griha Prakashan, Pune.
- Kanetkar T.P. and Kulkarni S.V. "Surveying and Levelling – Part2", Pune Vidyarthi Griha Prakashan, Pune.

Reference Books:

- Duggal S. K. "Surveying Volume I", Tata McGraw-Hill Publishing Company Limited.
- Duggal S. K. "Surveying Volume II", Tata McGraw-Hill Publishing Company Limited.
- Bannister A, Raymond S & Baker R. "Surveying", Pearson Education Ltd.
- Subramanium R., "Surveying & Levelling", Oxford University Press.
- Clark David, "Plane and Geodetic Surveying for Engineers Volume–I", CBS, 6/E.
- Clark David, " Plane and Geodetic Surveying for Engineers Volume –II", CBS, 6/E
- Clendinning J. "Principles of Surveying", Blackie
- Punmia B. C. "Surveying-I", Laxmi Publications (P) Ltd. New Delhi
- Punmia B. C., Jain A, Jain A., "Surveying-II", Laxmi Publications (P) Ltd. New Delhi

FACULTY OF SCIENCE AND ENGINEERING

Third Semester B.E. (Civil Engineering)

Course Code: **PCC**
Title of the Course: **Surveying & Geomatics Laboratory**

Course Scheme				Evaluation Scheme (Laboratory)		
Lecture	Tutorial	Practical	Credits	TW	POE	Total
0	0	3	1	25	25	50

LIST OF EXPERIMENTS : PERFORM ANY 2 PROJECT AND 8 PRACTICALS

1 Study of chain and compass.
2 Chain and compass Traverse Survey
3 Study and use of dumpy level, auto level to determine elevation of various points.
4 Measurement of horizontal and vertical angles by transit Theodolite.
5 Measurement of horizontal angles by repetition method.
6 Project-I -Theodolite traverse Survey project of a closed traverse with at least four stations, computation of area of the traverse.
7 Computation of horizontal distances and elevations by Tacheometry
8 Project-II-Tacheometric contouring project with two instrument stations about 60 m apart.
9 Radiation & intersection methods in plane table survey.
10 Project-III -Plane table survey project of a closed traverse with at least four stations, with details such as buildings, roads, etc.
11 Setting out a given building from a given foundation plan
12 Project-IV- Road project for a minimum length of 300 m including fixing of alignment, profile leveling, cross-sectioning, plotting of L section and cross section
13 Study and use of one second Theodolite and measurement of horizontal angle
14 Setting out a given horizontal angles and measurement of Vertical angles using one second Theodolite.
15 Finding out elevation of high object by Trigonometrical Leveling using one second Theodolite.
16 Study and use of Mirror Stereoscope and finding out Air base distance
17 Study and use of Total Station
18 Study and use of GPS.

FACULTY OF SCIENCE AND ENGINEERING

Third Semester B.E. (Civil Engineering)

Course Code: **PCC- 3**
Title of the Course: **Fluid Mechanics 1: Theory**

Course Scheme					Evaluation Scheme (Theory)				
Lecture	Tutorial	Practical	Periods/Week	Credits	Duration of Paper Hr.	MSE	IE	ESE	Total
3	1	0	4	3	3 hrs	10	10	80	100

Unit	CONTENTS	Hours
Unit 1	Properties of Fluid: Physical properties of fluids: density, specific weight, specific volume, relative density, Newton's Law of Viscosity, dynamic and kinematic viscosity, Classification of fluids, Reheological diagram, Newtonian and Non Newtonian fluids, ideal and real fluids, compressibility, cohesion, adhesion, surface tension, capillarity, vapour pressure. Dimensional Analysis and Model studies: Dimensions of physical quantities, Dimensional homogeneity, Dimensional analysis using Bukingham's Pai theorem, important dimensionless parameters and their significance. Geometric; Kinematic and Dynamic similitude; Model laws, Type of models, Applications of dimensional analysis and studies to fluid flow problems.	9 Hrs
Unit 2	Fluid Statics: The basic equation of hydrostatics, concept of pressure head, Measurement of pressure datum (absolute, gauge), Application of the basic equation of hydrostatics. Piezometers, Simple and differential manometers, inclined manometers, Introduction to pressure transducers. Total pressure, Center of pressure for plane and curved surfaces, Pressure Diagrams, Practical applications (gate, dams, lock gates) Buoyancy and Floatation: Principle of floatation and Buoyancy, Equilibrium of floating bodies, Stability of Floating bodies, metacentre, metacentric height and its determination (experimental and analytical), Stability of submerged bodies . Relative Equilibrium of liquids: Fluid masses subjected to uniform linear acceleration and rotational.	9 Hrs
Unit 3	Fluid Kinematics: Methods for describing the motion of fluid; Velocity and acceleration of fluids, Type of flow: Steady and unsteady, uniform and nonuniform, Laminar and Turbulent, one, two and three dimensional flows in Cartesian co-ordinate, Equation for one dimensional flow along a streamline, Rotational and irrotational motions, Circulation and vorticity, Derivation of Cauchy's Riemann equation, Velocity potential, stream function and flow net, Method of drawing flow net, use and limitation of flow net, Fluid Dynamics Forces acting on fluid mass in motion, Euler's equation of motion along a streamline and its integration, Assumptions of Bernoulli's equation, Kinetic energy correction factor, Hydraulic Grade line and total energy line, Linear momentum equation and momentum correction factor, angular momentum, Application of continuity, Bernoulli and momentum equations. Flow through orifices and mouthpieces under free and submerged condition, venturi meter, orifice meter, Nozzle meter, rotameter and pitot tube	9 Hrs

	Flow over Notches and Weirs: Classification of notches and weirs, Discharges over a sharp crested rectangular notch, velocity approach, end contractions, discharges over a triangular notch, trapezoidal notch, Cippoletti notch, Ventilation of weir, time required to empty a tank.	
Unit 4	Laminar Flow: Reynolds Experiment, Laminar flow through a circular pipe, Flow between tow fixed parallel plates, Stoke's law, Methods of measurement of viscosity, Flow through porous media, Darcy's law, Transition from laminar to turbulent flow. Boundary Layer Theory: Development of boundary layer on a flat plate, Nominal, displacement, momentum and Energy thicknesses. Laminar, turbulent and transitional boundary layer, Application of momentum equation for boundary layer development, Local and mean drag coefficient, Hydro dynamically smooth and rough boundaries, Boundary layer separation and its control.	9 Hrs
Unit 5	Flow through Pipes: Energy losses in pipe flow (major and minor losses) , Flow through pipes such as simple, compound, parallel, branched pipes and siphons, Dupit's equation, Hydraulic transmission of power through pipes, introduction to three reservoir problem and pipe network. Turbulent Flow: Characteristics of turbulent flow, instantaneous velocity, temporal velocity, scale of turbulence and intensity of turbulence , semi-empirical theories to estimates shear stress in turbulent flows using Boussinesq's theory, Prandtl's mixing length theory, velocity distribution in turbulent flow, Prandtl's velocity distribution equation, Karman Prandtl velocity distribution equations for smooth and rough boundaries, Equation for mean velocity for pipes, Darcy flow; Nikuradse's experiments on artificially roughened pipe, Friction factor for commercial pipes. Moody's diagram, explicit equation for friction factor.	9 Hrs

Text Books:

- Modi, P. N. and S. N. Seth " Hydraulics and Fluid Mechanics", Standard book house, New Delhi, ISBN: 978-81-89401-26-9
- Bernard Massey and John Ward Smith, " Mechanics of Fluids", Taylor and Francis, 8 Edition (2006) London and New York.
- Douglas J. F. Gaisorek J. M. , Swaffield J. A., "Fluid Mechanics" Addison-Weisley Harlow 1999.
- Shames I. H., " Mehcanics of Fluids", Mc Graw-Hill, New York 1992. Reference Books:
- R. J. Garde and Mirajgaonkar, " Fluid Mechanics Through Problems", New Age International
- Streeter V.L. Wylie E. Benjamin, "Fluid Mechanics ", Mc Graw Hil, London, 1998.

FACULTY OF SCIENCE AND ENGINEERING

Third Semester B.E. (Civil Engineering)

Course Code: **PCC**
Title of the Course: **Fluid Mechanics 1 Laboratory**

Course Scheme				Evaluation Scheme (Laboratory)		
Lecture	Tutorial	Practical	Credits	TW	POE	Total
0	0	2	1	25	25	50

LIST OF EXPERIMENTS : PERFORM ANY 10

1 Determination of Metacentric height

2 Verification of Bernoulli's theorem

3 Study of Impact of Jet

4 Study of major and minor losses in pipes

5 Study of velocity measurement by pitot tube

6 Determination of coefficient of discharge by venturimeter

7 Determination of coefficient of discharge by orificemeter

8 Determination of coefficient of hydraulic coefficient of sharp edged circular orifice

9 Determination of coefficient of discharge of external cylindrical mouth piece

10 Determination of coefficient of discharge of flow over rectangular notch

11 Determination of coefficient of discharge of flow over trangular notch

12 Study of status of flow using Reynold’s Apparatus

FACULTY OF SCIENCE AND ENGINEERING

Third Semester B.E. (Civil Engineering)

Course Code: **PCC- 2**
Title of the Course: **Geotechnical Engineering: Theory**

Course Scheme					Evaluation Scheme (Theory)				
Lecture	Tutorial	Practical	Periods/Week	Credits	Duration of Paper Hr.	MSE	IE	ESE	Total
3	1	0	4	3	3 hrs	10	10	80	100

Unit	CONTENTS	Hours
Unit 1	Properties of Soil : Introduction to Soil Mechanics, major soil deposits of India such as marine deposits, black cotton soils, lateritic soils, alluvial deposits and desert soils. Three phase soil system, weight volume relationships, index properties of soil - methods of determination and its significance, I.S. classification of soil. Soil structure: single grained and honey combed, flocculated and dispersed. Permeability and Seepage: Darcy's law, Factors affecting permeability, Determination of permeability by constant head and falling head method as per IS - 2720, field test as per IS – 5529 (part I) - pumping in test and pumping out test. Permeability of layered soils, Seepage forces, General flow equation. Flow net and its application.	9 Hrs
Unit 2	Compaction and Consolidation: Soil compaction phenomenon, Factors affecting compaction. Dry density and moisture content relationship. Zero air voids line, Effect of compaction on soil structure. Standard Proctor test and Modified Proctor test as per IS – 2720. Field compaction equipment and methods for cohesive and non-cohesive soils, Introduction to consolidation, coefficient of consolidation, Degree of consolidation, Determination of pre consolidation pressure	9 Hrs
Unit 3	Shear Strength of Soil and bearing capacity: Mohr's circle, Mohr-coulomb failure criteria, Effective stress concept. Peak and residual shear strength. Factors affecting shear strength. Laboratory measurement of shear strength by direct, unconfined and triaxial tests under different drainage conditions. Vane shear test Bearing Capacity of Foundation: Types of foundations, Terzaghi's and Meyerhoff bearing capacity analysis, effect of various BC factor on bearing capacity, Shear failure and Settlement criteria, Use of field test (SPT and Plate Load) data for bearing capacity determination.	9 Hrs
Unit 4	Lateral Earth Pressure: Earth pressure on vertical wall, effect of wall movement on earth pressure, earth pressure at rest, Rankine's theory, lateral earth pressure due to submerged backfill, backfill with uniform surcharge, backfill with sloping surface, Coulomb's theory, culmann's method, Poncelet's construction.	9 Hrs
Unit 5	Stability of Slopes: Slope classification, slope failure, modes of failure. Infinite slope in cohesive and cohesion less soil, slope stability analysis using Swedish Slip Circle Method, Friction Circle method	9 Hrs

Textbooks:

• Gopal Ranjan and A S Rao, “Basic and Applied Soil Mechanics”, G. K. Publications pvt. Ltd

• V. N. S. Murthy, “Soil Mechanics and Foundation Engineering”, B.S.Publications (3 rd Edition)

• B. C. Punmia, “Soil Mechanics and Foundation Engineering”, Laxmi Publishing Co., New Delhi.

• Dr. B. J. Kasmalkar ,“Geotechnical Engineering”, Pune Vidyarthi Griha Prakashan, 1986

Reference Books:

• Joseph E Bowles, “Engineering Properties of Soils And Their Measurements”, McGraw Hill Publications (2001)

• Lambe and Whitman ,“Soil Mechanics”, S. Chand publications(SI Version),(1969).

• Donald P Coduto, Man-chu Ronald Yeung and William A. Kitch “Geotechnical Engineering Principle and practice”, McMillan Press (PHI) (2010)

• P Purushothma Raj ,“Geotechnical Engineering”, McGraw Hill Publication 4th Edition (2008) • Compendium of Indian standards on soil engineering part 1 (1980)

FACULTY OF SCIENCE AND ENGINEERING

Third Semester B.E. (Civil Engineering)

Course Code: **PCC**
Title of the Course: **Geotechnical Engineering Laboratory**

Course Scheme				Evaluation Scheme (Laboratory)		
Lecture	Tutorial	Practical	Credits	TW	POE	Total
0	0	2	1	25	25	50

LIST OF EXPERIMENTS : PERFORM ANY 10

1 Determination of moisture content by Oven Dry method

2 Determination of Specific gravity of soil (Pyconometer, Density bottle)

3 Grain size analysis of soil (Sieve Analysis)

4 Determination of Atternberg Limits

5 Determination of Permeability by constant head and falling head

6 Determination of Compaction characteristics of soil by Proctor compaction test

7 Determination of field density by core cutter method

8 Determination of field density by sand replacement method

9 Determination of Shear parameters of soil by unconfined compression test

10 Determination of shear parameters of soil by direct shear test

11 Determination of swell value of soil

12 Demonstration of Triaxial shear test

FACULTY OF SCIENCE AND ENGINEERING

Fourth Semester B.E. (Civil Engineering)

Course Code: **PCC-CE401**
Title of the Course: **Building Construction: Theory**

Course Scheme					Evaluation Scheme (Theory)				
Lecture	Tutorial	Practical	Periods/Week	Credits	Duration of Paper Hr.	MSE	IE	ESE	Total
3	0	0	3	2	3 hrs	10	10	80	100

Unit	CONTENTS	Hours
Unit 1	**Foundations :** Necessity and types of foundation , Details shallow foundations. Bearing capacity of soils and its assessment . Preumptive bearing capacity values from codes. Loads on foundation ,Causes of failures of foundation and remedial measures, Foundation on black cotton soils, Setting out foundation trenches, excavation timbering of foundation trenches. Load bearing and framed structures.	9 Hrs
Unit 2	**Brickwork :** Qualities of good bricks , classification of bricks, tests on bricks as per as codes. Terms used in brickwork , commonly used types of bonds in brickwork such as header, stretcher, english and Flemish bonds, principles of construction.Reinforced brickwork , brick knogging.Parapets, coping, sills and corbels, brief introduction to cavity walls , load bearing and partition walls.Masonry construction using cement concrete blocks and clay walls, load bearing and partition walls.Masonry construction using cement concrete blocks and clay blocks. **Precast construction:** introduction to method and materials . precast elements likes poles, cover, jallies, steps corbets, truss elements etc.	9 Hrs
Unit 3	**Stone Work :** Stone , cutting and dressing , selection of stones types of stone masonary, principles of construction joints in masonary . Lifting heavy stones, common building stones in India. **Arches and Lintels :** Terminology in construction , types ,chajjas and canopies, pre cast Lintels & Arches. **Floors:** General principle, types and method of construction, upper floors finish & quality and floor tiles, synthetic & Ceramic Tiles.	9 Hrs
Unit 4	**Roofs:** Flat and pitches roofs, roof covering, types and their construction features. Thermal Insulation. **Stairs:** Types of stairs, functional design of stairs. Doors and Windows: Purpose, materials of construction and types	9 Hrs
Unit 5	**Damp Proofing:** Causes and effect of dampness .Various methods of damp proofing Damp proofing in plinth protection, New Techniques of Damp proofing Damp Proofing in Plinth Protection, New Techniques of damp	9 Hrs

	proofing, Epoxy etc. **Plastering and Pointing**: Necessity, types and methods. **Temporary Timbering:** Centering and formwork shoring, underpining and scaffolding. **Painting:** White washing, colour washing and distempering, new materials & Techniques.	

Reference books:-

1) Building Technology by Sushil Kumar, Standard Publishers Distributors, 2006

2) Building Construction and material by Dr. B. C. Punmia and Jain, Laxmi Publication

3) Building Construction By Rangawala, Charotar Publishing House Pvt. Limited, 2009

FACULTY OF SCIENCE AND ENGINEERING

Fourth Semester B.E. (Civil Engineering)

Course Code: **PCC-CE402**
Title of the Course: **Concrete Technology: Theory**

Course Scheme					Evaluation Scheme (Theory)				
Lecture	Tutorial	Practical	Periods/Week	Credits	Duration of Paper Hr.	MSE	IE	ESE	Total
3	1	0	4	3	3 hrs	10	10	80	100

Unit	CONTENTS	Hours
Unit 1	**General ingredients of Concrete:** **Cement:** Main constituents of cements, Hydration of cement. Specifications of cement and respective IS codal provisions. **Aggregates:** Sources of aggregates, classification and nomenclature. Aggregate characteristics and their significance in strength, workability, placement and compaction of concrete. Sampling, particle shape and texture, bond of aggregate, size & grading of aggregate strength of aggregate. Mechanical properties– Specific gravity, bulk density, porosity, absorption of aggregate, moisture content of aggregate, bulking of sand abrasion test, impact value. Deleterious substances in aggregate, organic impurities, clay and other fine material etc. Soundness of aggregate, crushed sand. Alkali aggregate reaction and respective IS codal provisions. **Water:** quality of water suitable for concrete mixing and respective IS codal provisions.	9 Hrs
Unit 2	**Properties of Concrete:** Shrinkage- early volume changes, drying shrinkage, mechanism of shrinkage, factors affecting shrinkage, influence of curing and strong conditions, differential shrinkage, carbonation, Creep- factors influencing, relation between creep and time, nature of creep, effect of creep. **Introduction of IS Codes:** IS:383 and IS codes of tests of aggregates, IS:456, SP:23, various IS codes of cement specifications and tests, **Fresh Concrete:** Batching, mechanical mixers, automatic batching and mixing plants. efficiency of mixing, workability measurement - Slump cone test, compacting factor test, flow table, Vee-Bee consistometer. Factor affecting workability, setting time, Significance of w/c ratio, Segregation, bleeding, voids, and permeability. Hot weather concreting, conveyance of concrete, placing of concrete, compaction, vibrators, curing of concrete, significance, methods of curing, temperature effects on curing and strength gain.	9 Hrs
Unit 3	**Strength of concrete-** Gain of strength, w/c ratio. Factors affecting compressive strength, w/c ratio, type of cement, air entrainment, aggregate, mixing water, admixtures, curing conditions. Tensile and flexural strengths, relation between compressive and tensile strength. Failure modes in concrete,	9 Hrs

	cracking in compression. Impact strength, fatigue strength, shear, elasticity, poisson's ratio. Testing of hardened concrete. Compression test cubes, strength and cylinder strength and their relation, effect of aspect ratio on strength. Flexural strength of concrete, determination of tensile strength, indirect tension test, abrasion resistance, accelerated curing test IS codes of tests on hardened concrete. **Non Destructive test-** significance, rebound hammer, ultra sonic pulse velocity test. IS codes of NDT.	
Unit 4	**Durability of concrete-** Significance, water as an agent of deterioration, permeability of concrete, air sulphate attack and control, sea water attack, acid attack, efflorescence, resistance of corrosion, abrasion and cavitations, process of rusting of steel. Codes of tests of durability of concrete. Additives of concrete:- Types of admixtures, natural products, diatomaceous earth, calcined clays of shales, volcanic glasses, byproducts – pozzolona, fly ash, silica fume, rice husk ash, G.G. blast furnace slag, **Admixtures of concrete-** air entraining, water reducing, accelerators, retarders, plasticizers and super plasticizers, permeability reducing, grouting agents, surface hardeners.	9 Hrs
Unit 5	Concrete Mix Designs- Study of IS 10262:2019. Comparison of IS 10262:1982,2009 and 2019. Mix designs of mass concrete, ordinary and standard grade concrete, high strength concrete, self compacting concrete, pump able concrete by Indian Standard methods. Overview on Mix designs by the methods other than Indian Standard Methods.	9 Hrs

Reference books:-

1) Concrete technology by M.S.Shetty, S.Chand & Co.Ltd.

2) Properties of Concrete by A.M. Neville, Pearson Publication.

3) Concrete Technology by M.L.Gambhir,Tata Mcgraw hill

4) Chemistry of Cement and Concrete by F.M. Lee, Chemical Publishing Co., Inc.

FACULTY OF SCIENCE AND ENGINEERING

Fourth Semester B.E. (Civil Engineering)

Course Code: **PCC-CE408**
Title of the Course: **Concrete Technology: Laboratory**

Course Scheme				Evaluation Scheme (Laboratory)		
Lecture	Tutorial	Practical	Credits	TW	POE	Total
0	0	2	1	25	25	50

LIST OF EXPERIMENTS : PERFORM ANY 10	
1	Determination of Fineness, Normal Consistency, setting time, soundness of cement
2	Determination of Compressive Strength of cement
3	Determination of Specific gravity of cement, fly ash, fine aggregates, coarse aggregates and rubble and
4	Determination of bulk density of cement, fly ash, fine aggregate and coarse aggregates
5	Determination of Silt and Clay content, Bulking, Sieve analysis of Fine aggregates
6	Determination of Crushing Value, Impact Value, Abrasion Value of Coarse aggregates
7	Determination of flakiness Index, elongation Index and soundness and Sieve analysis of Coarse aggregates.
8	Workability tests of Concrete: Slump test, Compaction factor test, Vee Bee test, flow test.
9	Strength tests of concrete: Compressive strength test, Flexural strength test, Split tensile strength test, accelerated curing test.
10	Concrete mix design by IS 10262:2019 (any two)
11	Non destructive testing of Concrete: Rebound hammer test, ultrasonic pulse velocity test and Test for PH of concrete Or for carbonation

FACULTY OF SCIENCE AND ENGINEERING

Fourth Semester B.E. (Civil Engineering)

Course Code: **PCC-CE403**
Title of the Course: **Engineering Geology: Theory**

Course Scheme					Evaluation Scheme (Theory)				
Lecture	Tutorial	Practical	Periods/Week	Credits	Duration of Paper Hr.	MSE	IE	ESE	Total
3	0	0	3	2	3 hrs	10	10	80	100

Unit	CONTENTS	Hours
Unit 1	GENERAL GEOLOGY:-Definition and scope & Geology, Internal structure of the earth, plate tectonics. Earthquake:- Terminology, Earthquake waves , causes and effects , intensity , magnitude , location of epicenter , tsunami, earthquake zones of India , Volcanoes and their products. MINROLOGY:-Definition and classification of minerals. General physical characters of following mineral group silica, feldspar, mica and pyroxene.	9 Hrs
Unit 2	STRUCTURAL GEOLOGY: Folds:- Parts of fold, classification, effects on outcrops, identification of fold in the field, importance of fold in civil Engineering . Faults:- Terminology , classification, recognition of fault in the field , importance of fault in civil engineering , Problems of dip, strikes and thickness of beds.	9 Hrs
Unit 3	PETROLOGY: Igneous rock:- Rock cycle Magma and lava, Tabular classification of igneous rocks. Textures and structures of igneous rock. Petro graphic description of common igneous rock. Sedimentary rocks: Texture and structure of sedimentary rocks , classification of sedimentary rock, Petro graphic description of common sedimentary rocks. Metamorphic rocks: Metamorphism , classification of metamorphic rocks, petrography description of common metamorphic rocks	9 Hrs
Unit 4	ENGINEERING GEOLOGY: Engineering properties of rocks , rock as a construction material, building stones, road metal ballast, surface and subsurface geophysical investigation , geological mapping , application of geology to the location , design and construction of dams , bridges and tunnels.	9 Hrs
Unit 5	GEOHYDROLOGY: Hydrologic cycle, occurrence of ground water, Water table and water table maps, perched water table aquifer, aquiclude, aquifuge and aquitard, confined and unconfined aquifer, and springs.	9 Hrs

Reference books:-

1. A Text book of Geology by P.K.Mukherjee, Raidant Publisher
2. Principles of Engineering Geology by K.M.Bangar, Standard Publisher Distributer
3. Engineering Geology Manual by B.S.Satyanarayana Swami
4. Principles of Petrology By G.W.Tyrell

5. Geological Maps by G.W.Chiplunkar
6. Physical & Engineering Geology By S.K.Garg, khanna publication,2003

FACULTY OF SCIENCE AND ENGINEERING

Fourth Semester B.E. (Civil Engineering)

Course Code: **PCC-CE404**
Title of the Course: **Strength of Material: Theory**

Course Scheme					Evaluation Scheme (Theory)				
Lecture	Tutorial	Practical	Periods/Week	Credits	Duration of Paper Hr.	MSE	IE	ESE	Total
3	1	0	4	4	3 hrs	10	10	80	100

Unit	CONTENTS	Hours
Unit 1	Mechanical properties and uni-axial problems: Types of force distribution, concept of stress and strain, stress strain behavior of ductile and brittle material in uni-axial state of stress. Elastic, plastic and strain hardened zones stress – strain relations, elastic constants, relation between elastic constants.Uni-axial loading and deformation of simple cases of statically indeterminate problems under axial loading.Thin walled pressure vessel, cylindrical and spherical shells subjected to internal pressure.	9 Hrs
Unit 2	Axial force, shear force and bending moment diagram: Concept of free body diagram, types of loads, determination of axial forces and shear forces and bending moment at a section. Axial forces SF and BM diagram in beams and simple frames, differential relation between shear force and bending moments, Relation between load and shear force.	9 Hrs
Unit 3	Stresses in beam: Bending stresses in simple beam. Assumptions and derivation of simple bending theory, relation between bending moment, bending stress and curvature of homogeneous and composite beams. Shear stresses in simple beams, shear flow and shear stress distribution, shear Stress in composite beams.Combine effect of BM and axial force.	9 Hrs
Unit 4	Torsion of Shafts: Torsion of circular sections, assumptions and derivation of relations between torsional moment, shear stresses and angle of twist. Torsional stress in solid and circular sections, torsion in thin walled hollow section closely coiled helical springs. Leaf spring. Deflection of Beams: Derivation of differential equation of moment curvature relation, deflection of beams by integration, Macauley's method.	9 Hrs
Unit 5	State of stress In Two Dimensions: State of stress in two dimensions, differential equation of equilibrium, transformation of stresses , principal stresses, maximum shear stresses, Mohr's circle, combined bending and torsion, combined effect of Torsion and Shear. Shear flow in thin walled sections, concept of shear center of thin walled section, Unsymmetrical bending.	9 Hrs

Reference books:-

1. Strength of materials (vol.1 & 2) , S.P.Timoshenko, McMillan & Company, London

2. Strength of material – Ferdinand L. Singer, Harper Collins Publisher Inc, Singapore
3. Strength of material –U.L.Jindal, Galgotia Pub, 2000.
4. Strength of materials (vol.1 & 2) Vazirani Ratawani.

FACULTY OF SCIENCE AND ENGINEERING

Fourth Semester B.E. (Civil Engineering)

Course Code: **PCC-CE409**
Title of the Course: **Strength of Material: Laboratory**

Course Scheme				Evaluation Scheme (Laboratory)		
Lecture	Tutorial	Practical	Credits	TW	POE	Total
0	0	2	1	25	25	50

LIST OF EXPERIMENTS : PERFORM ANY 10	
1	Study of strain measuring instruments mechanical, electrical types.
2	Tension test on metals.
3	Hardness test on metals.
4	Torsion test on metals.
5	Impact test on metals
6	Transverse test on beams including deflections.
7	Compression test on bricks & stones
8	Measurement of static strains using electrical resistance gauge.
9	Deflection of springs
10	Bricks: Absorption test, Dimension test, Crushing strength, Efflorescence.
11	Tiles: Flooring transverse strength, water absorption, and Flexural rigidity test
12	Timber: Moisture content, strength parallel and Perpendicular grain transverse strength.

FACULTY OF SCIENCE AND ENGINEERING

Fourth Semester B.E. (Civil Engineering)

Course Code: **PCC-CE405**
Title of the Course: **Environmental Engineering: Theory**

Course Scheme					Evaluation Scheme (Theory)				
Lecture	Tutorial	Practical	Periods/Week	Credits	Duration of Paper Hr.	MSE	IE	ESE	Total
3	0	0	3	3	3 hrs	10	10	80	100

Unit	CONTENTS	Hours
Unit 1	Sources of water : Rain water, Ground water – springs, infiltration galleries, Dug wells, tube wells , Surface water – stream , lake river, impounding reservoirs, ponds. Intake structures : Location types – river , lake , canal reservoir etc. Sources of water and their yield, population forecast, Quantity of water, rate of water consumption for various purposes, factors affecting, fire demand. Water quality : Water Quality Standards, General idea of water borne diseases, Physical characteristics: colour, taste and odour, temperature, turbidity. Chemical characteristics: total solid, chlorides, hardness, pH value, metals and other chemicals, nitrogen , dissolved gases. and bacteriological characteristics of water, Standards of drinking water .	9 Hrs
Unit 2	Water treatment: Objective of treatment, unit, operations and processes, treatment flow sheet of conventional water treatment plant. Aeration : Purpose , types of aerators. Coagulation and Flocculation: Definition, Principals, types of coagulants and reactions , coagulant doses , types of mixing and flocculation devices. Sedimentation: Principles, types of setting basins, inlet and outlet arrangements. Clariflocculators: Principles and operation.	9 Hrs
Unit 3	Filtration: Mechanism of filtration , types of filters, RSF, SSF , pressure filters, elements of filters UDS, design aspects filter sand specification ES, UC, operational problems in filtration. Disinfection: Purpose, Mechanism , criteria for good disinfectant various disinfectants their characteristics, disinfection by chlorination using different forms of chlorine.	9 Hrs
Unit 4	Sewage quantity: Collection and conveyance of sewage, sources of sewage, variations in sewage flow, Design of circular sanitary sewers. Sewer materials and sewer appurtenances. Characteristics of sewage: Physical, chemical and biological characteristics, Sampling, analysis of sewage for pH, Suspended Solid, Total Solids, COD, BOD, TOC, Chlorides, Nitrate, ammonical Nitrogen and sulphates. Process flow diagram for sewage treatment. Sewage treatment: Process flow diagram for sewage treatment, Theory and design of screen chamber, Grit Chamber and Primary sedimentation tank as per	9 Hrs

	the Manual of CPHEEO. Theory & design of secondary treatment units: Biological principle, important microorganisms in waste water & their importance in waste water treatment systems, bacterial growth, general growth pattern, growth in terms of bacterial numbers and bacterial mass. Kinetics.	
Unit 5	Activated sludge process: Types of ASP, Design of ASP, sludge volume index, sludge bulking and control. Trickling filter: Biological principle, different T.F media & their characteristics, design of standard rate and high rate filters using NRC formula, single stage & two stage filters, recirculation, ventilation, operational problems, control measures. Theory & design of anaerobic treatment units: Septic tanks, suitable conditions & situations, biological principle, method of treatment & disposal of septic tank effluent. Design of septic tank along with up flow filters and soak pit. Anaerobic digester: Principal of anaerobic digestion, stages of digestion, factors governing anaerobic digestion, Methods of sludge treatment and disposal, advantages & disadvantages. Up-flow Anaerobic Sludge Blanket (UASB) Reactor– Principle, advantages & disadvantages. Low cost treatment methods: Oxidation pond: Bacteria – algae symbiosis, advantages & disadvantages of oxidation ponds. Aerated lagoons: Principle, aeration method, advantages & disadvantages of aerated lagoons. Introduction and theory of Phytoremediation technology for wastewater treatment. Introduction and theory of root zone cleaning system.	9 Hrs

Reference books:-

1) Environmental Engg (vol 1 & 2) by B.C.Punmia, Laxmi Publication

2) Environmental Engg. (Vol. 1&2) by S.K.Garg

3) Environmental Engg.by Birdee, Dhanpat Rai and Sons, 1996

4) G.M. Fair, J.C. Geyer, D.A. Okan, Elements of Water Supply and Wastewater Disposal, John Wiley and Sons Inc., 1971.

5) M.J. Hammer, Water and Waste Water Technology, John Wiley and Sons, New York, 1986.

6) Environmental Engg. – Davis - McGraw Hill Publication

7) Waste Water Treatment & Disposal – Metcalf & Eddy - TMH publication

FACULTY OF SCIENCE AND ENGINEERING

Fourth Semester B.E. (Civil Engineering)

Course Code: **PCC-CE410**
Title of the Course: **Strength of Material: Laboratory**

Course Scheme				Evaluation Scheme (Laboratory)		
Lecture	Tutorial	Practical	Credits	TW	POE	Total
0	0	2	1	25	25	50

LIST OF EXPERIMENTS : PERFORM ANY 10	
1	Determination of pH
2	Determination of hardness
3	Determination of turbidity
4	Determination of DO
5	To determine the amount of suspended solids(SS), dissolved solids(DS) & total solids(TS) in a given sample of water.
6	Determination of the concentration of chlorides
7	Determination of COD
8	Determination of BOD
9	Bacteriological plate count & MPN (Most Probable Number) tests.
10	Site visit to water treatment plant. A report based on the visit to water treatment plant would be submitted and would form a part of the term work.
11	Site visit to waste water treatment plant. A report based on the visit to waste water treatment plant would be submitted and would form a part of the term work.

FACULTY OF SCIENCE AND ENGINEERING

Fourth Semester B.E. (Civil Engineering)

Course Code: **PCC-CE406**
Title of the Course: **HYDROLOGY AND WATER RESOURCES: Theory**

Course Scheme					Evaluation Scheme (Theory)				
Lecture	Tutorial	Practical	Periods/Week	Credits	Duration of Paper Hr.	MSE	IE	ESE	Total
3	0	0	3	2	3 hrs	10	10	80	100

Unit	CONTENTS	Hours
Unit 1	Introduction: Hydrological cycle, water balance equation, Precipitation-forms and types, equipments, methods of measurement. Optimum number of rain gauges, Radar measurement of rainfall, Estimation of missing rainfall data	9 Hrs
Unit 2	Abstractions: Infiltration- Defination, mechanism, factors affecting, infiltration indices, measurement. Evaporation, Transpiration-Definition, mechanism, Factors affecting evaporation, Estimation by pans, water budget, energy budget and empirical formula, Methods control of evaporation, Evapotranspiration, Interception	9 Hrs
Unit 3	Runoff: Sources and components of runoff, Classification of streams and measurement of discharge of a stream by Area – Slope and Area – Velocity methods. Hydrograph: Flood hydrographs and its components, S-Curve technique, unit hydrograph, synthetic hydrograph.	9 Hrs
Unit 4	Statistical Methods, Statistics in hydrological analysis, Various methods of averages. Probability of an event, Frequency analysis, time series Floods: Causes and effects, Factors affecting peak flows and its estimation, Flood routing and Flood forecasting	9 Hrs
Unit 5	Groundwater: Introduction, Occurrence and distribution of Groundwater, Water table, Acquifers, Ground water exploration, Electrical resistivity method, Darcy's law. Introduction to hydraulics of wells, Open wells - yield test.	9 Hrs

Reference books:-

1) S. K. Garg,Hydrology and water resources Engineering, Khanna Publishers.
2) M. J. Deodhar, Elementary Engineering Hydrology, Pearson Education, Edition 2009.
3) Raghunath H M, Hydrology, Wylie Publication, 1996.
4) Chow Ven Te, Maidment R David, Mays W Larry, Applied Hydrology, McGraw-Hill New Delhi, 1998.
5) Subramanya K, Engineering Hydrology, Tata McGraw-Hill, New Delhi, 1996.