DEPARTMENT OF CIVIL ENGINEERING

UNDER GRADUATE - CIVIL ENGINEERING

S.Y. B.Tech. (Civil Engineering) Curriculum Structure: CBCS
(Academic year 2019-20 onwards)

Program Education Objectives (PEOs)

The Graduates will be able to:

PEO1	Pursue a successful career in the diversified sectors of the engineering industry and/or higher studies by acquiring knowledge in mathematical, scientific and engineering fundamentals.
PEO2	Analyze and design Civil engineering systems with social awareness and responsibility.
PEO3	Exhibit professionalism and ethical approach through leadership, team work, good communication skills, and adapt to modern trends by engaging in lifelong learning.

Program Outcomes (POs)

On successful completion, graduates will be able to:

PO1	Apply knowledge of mathematics, science and engineering to civil engineering problems.
PO2	Identify, formulate and solve civil engineering problems.
PO3	Design various structures or particular system that meets desired specifications and requirements.
PO4	Design and conduct experiments, interpret and analyze data, synthesize the information to derive conclusions.
PO5	Select and use appropriate engineering techniques and software tools to analyze civil engineering problems with understanding of their applicability and limitations.
PO6	Assess local and global impact of societal issues on civil engineering profession.
PO7	Able to understand the impact of engineering solutions on society and demonstrate the knowledge for sustainable development.
PO8	Demonstrate their professional and ethical responsibilities.
PO9	Able to function as a member or a leader on engineering and science teams in various areas of civil engineering.
PO10	Communicate effectively in both verbal and written forms.
PO11	Understand and practice engineering and management principles.
PO12	Adapt transformations in industry through independent and lifelong learning.

Program Specific Outcomes

PSO1: Establish a Civil Engineering career in industry, government or academic field and achieve professional expertise as appropriate.
PSO2: Execute innovation and excellence in Civil engineering problem solving and design in global and societal contexts.
PSO3: Commit to lifelong learning and professional development in the Civil Engineering field to stay updated in technology, research topics and contemporary issues.
PSO4: Understand the fundamentals of Civil Engineering in commercial contexts and in expediting construction projects.

PO/PSO ⇩ PEO ➡	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
I	✓	✓	✓	✓	✓	--	--	--	✓	✓	--	--	✓	✓	--	✓
II	✓	✓	✓	✓	✓	✓	✓	--	✓	--	✓	✓	--	✓	✓	✓
III	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

Semester I						
Course Code	**Name of the course**	**L**	**T**	**P**	**Credits**	
					Th	**Pr**
BSC271	Mathematics-III: Transform Calculus and Differential Equations	3	--	--	3	--
PCC-CE201	Strength of Materials	4	--	2	4	1
PCC-CE202	Fluid Mechanics	3	--	2	3	1
PCC-CE203	Surveying and Geomatics	3	--	2	3	1
PCC-CE204	Building Construction	3	--	2	3	1
HMC279	Civil-Societal and Global Impact	2	--	--	2	--
BSC261	Mathematical Foundation for Engineering*	2	--	--	Audit	
	Total	**20**	--	**8**	**22**	
Semester II						
Course Code	**Name of the course**	**L**	**T**	**P**	**Credits**	
					Th	**Pr**
BSC274	Mathematics-IV: Statistical and Numerical Methods	3	--	--	3	--
PCC-CE205	Theory of Structures-I	3	1	--	4	--
PCC-CE206	Hydraulic Engineering	3	--	2	3	1
PCC-CE207	Concrete Technology	2	--	2	2	1
ESC280	Building Planning and Computer Aided Drawing	3	--	2	3	1
ESC281	Basic Electronics	1	--	2	1	1
MAC277	Indian Constitution	2	--	--	Audit	
	Total	**17**	**1**	**8**	**20**	

L – No. of Lecture Hours/week, T – No. of Tutorial Hours/week, P – No. of Practical Hours/week

* Mathematical Foundation for Engineering course (Open Elective) for Direct second year students is mandatory.

- The evaluation of 'Theory Course' shall be continuous and consist of In-semester Evaluation I (ISE-I) of 10 Marks, Mid Term Examination (30 Marks), In semester Evaluation II (ISE-II) of 10 Marks and End Term Examination (50 marks) as per the academic Calendar of the institute.
- The evaluation of term work (practical examination) shall be continuous as per the academic Calendar of the institute
- Student can register for more courses other than prescribed (May be from other department or open electives) as per his/her interest and those credits will be treated as over and above

SEMESTER - I

BSC271	**Mathematics-III: Transform Calculus and Differential Equations**	**L:03, T:00, P:0**	**Credits: 03**

Course Objectives:

1. To understand the concepts of Laplace transforms, Fourier Series, Fourier transforms
2. To apply Laplace transforms for solving ordinary differential equations
3. Define and compute the line integral, surface integral, volume integral using Green's theorem, Stoke's theorem and the divergence theorem.
4. To understand the methods of solving partial differential equations such as wave equation, heat equation and Laplace equation.

Course Outcomes:

On successful completion of this course students will be able to

CO1	Develop the skills of Laplace transforms, Fourier series and Fourier transforms and their inverses.
CO2	Develop the skills of solving partial differential equations
CO3	Solve ODE's and PDE's using the properties of Laplace transform, Fourier series and Fourier transforms.
CO4	Determine solutions of PDE for vibrating string and heat conduction.
CO5	Evaluate line integrals, surface integrals, and volume integrals and convert line integrals into area integrals and surface integrals into volume integrals using integral theorems

Articulation Matrix

PO ➡ / ⬇ CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO 1	3	3										2
CO2	3	3	1	2								2
CO3	3	3	1	2								2
CO4	3	3	1	2								2
CO5	3	3	2	2								2

Note: 1-Low, 2-Medium or 3- High.

Unit 1: Laplace Transforms (10 hours)

Laplace transforms, inverse Laplace transforms, Properties of Laplace transforms, Laplace transforms of unit step function, impulse function, Convolution theorem; Applications of Laplace transforms - solving certain initial value problems.

Unit 2: Fourier Series (07 hours)
Expansion of a function in Fourier series for a given range - Half range sine and cosine expansions.

Unit 3: Fourier Transforms (10 hours)
Fourier Integrals, Fourier transforms-sine, cosine transforms and inverse transforms - simple illustrations

Unit 4: Vector Calculus (10 hours)
Line integrals, surface integrals, Integral Theorems: Greens theorem, the divergence theorem of Gauss and Stoke's theorem

Unit 5: Partial Differential Equations (08 hours)
Method of Separation of variables for solving partial differential equations, first and second order one dimensional wave equation, heat equation and two dimensional Laplace equation.

References:

1. Erwin Kreyszig, *Advanced Engineering Mathematics*, Eighth Edition, John Wiley and Sons, 2015.
2. R. K. Jain and S. R. K. Iyengar, *Advanced Engineering Mathematics*, Fifth Edition, Narosa Publishing House, 2016.
3. I. N. Sneddon, Elements of Partial Differential Equations, Dover Publications, Inc. Mineola New York.

PCC-CE201	**Strength of Materials**	**L:04, T:0, P:02**	**Credits: 05**

Course Outcomes: At the end of the course the student will be able to

CO1	Remember and recall fundamentals of applied mechanics.
CO2	Understand the behavior of materials under different stress and strain conditions.
CO3	Apply fundamentals of applied mechanics to solve problems of stress-strain, simple bending, direct and bending stresses.
CO4	Analyse bending moment, shear force diagram, bending stress and shear stress distribution for beams under the different conditions of loading and calculate the deflection.

Mapping of course outcomes with programme outcomes

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	--	--	--	--	--	--	--	--	--	--
CO2	2	2	--	1	--	1	--	--	1	--	--	--
CO3	3	3	--	1	--	1	--	--	1	--	--	--
CO4	3	2	--	1	--	1	--	--	1	--	--	--

1: Slightly 2: Moderately 3: Substantially

Unit.1

Shear Force and Bending Moment in Beams: Introduction to types of beams, supports and loadings. Definition of bending moment and shear force, Sign conventions, relationship between load intensity, bending moment and shear force. Shear force and bending moment diagrams for statically determinate beams subjected to points load, uniformly distributed loads, uniformly varying loads, couple and their combinations. (8 hrs)

Unit.2

Stress and Strain: Simple stress and strain due to tension and compression. Elastic constants. Stress–Strain diagrams for brittle and ductile materials. Strain Energy under gradual and impact loads, Statically determinate and Indeterminate problems and Thermal effects. (8 hrs)

Unit. 3

Compound Stress and Strain: Analysis of biaxial stress at a point, Principal planes, Principal stresses and strains. Mohr's circle, application to different case. (04 hrs)

Thin Cylinders: Thin cylindrical shells under internal fluid pressure stresses, strains and changes in dimensions, Wire wound thin cylinders. (04 hrs)

Unit.4

Theory of Simple Bending: Assumptions, Theory of pure bending, Distribution of bending stress, Composite and built up beam sections. (04 hrs)

Shear Stress Distribution: Shear stress distribution in various shapes of cross section of beams. (04 hrs)

Unit.5

Deflection of Beams: Slope and deflection of simply supported beams and cantilevers by Double Integration technique, Macaulay's method and Moment area method. (08 hrs)

Unit.6

Torsion of Circular Shafts: Theory of pure torsion, solid and hallow circular sections. Torsional shear stresses. Power transmission. (03 hrs)

Direct and Bending Stresses: Direct and bending stresses for eccentrically loaded short column, Core of a rectangular, square and circular section. (04 hrs)

TERM WORK:
Term work shall consist of eight laboratory experiments to be conducted from the list given below.

1. Tension tests on mild steel to study stress – strain characteristics.
2. Bending test on timber and metal on a simply supported beam.
3. Torsion test on circular bars.
4. Impact test – Izod and Charpy.
5. Hardness test on steel, brass and Aluminium.
6. Punching shear test on Hounsfield Tensiometer
7. Absorption and crushing test on bricks.
8. Strain measurements in beams using mechanical extensometer.

REFERENCE BOOKS:

1. Mechanics of Materials Vol. I by S. B. Junnarkar and Dr. H. J. Shah, Charotar Publishing House
2. Strength of Materials by A. R. Basu, Dhanpat Rai & Co.
3. Engineering Mechanics & Solids by E.P. Popov. SI version, Prentice Hall of India
4. Strength of materials : Elementary theory and Problems by Stephen Timoshenk, Van Nostrand

PCC-CE202	**Fluid Mechanics**	**L:03, T:0, P:02**	**Credits: 04**

Course Outcomes: At the end of the course the student will be able to

CO1	Define the basic concepts of fluid and its properties.
CO2	Understand the concepts of dimensional analysis use the dimensionless number suitably.
CO3	Apply the Bernoulli's equation to solve the problems in fluid.
CO4	Analyse pressures and forces on plates/surfaces, pipe bends, etc.
CO5	Apply the principles of hydrostatics and determine the forces.

Mapping of course outcomes with programme outcomes

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	2	2	--	--	2	2	3	--	--	--
CO2	2	3	3	2	2	2	3	2	2	2	1	--
CO3	2	2	2	3	2	3	3	3	2	2	1	2
CO4	3	3	3	3	2	2	1	2	1	--	2	1
CO5	3	3	2	3	3	3	3	3	1	1	2	2

1: Slightly 2: Moderately 3: Substantially

Unit.1

Introduction: Definition of fluid, Properties of fluids, dimensions and units, continuum concept of system and control volume. (06 hrs)

Unit.2

Fluid Statics: Pressure at a point, Pascal's law, Hydrostatic pressure on plane and curved surfaces, Absolute, Gauge, Atmospheric and vacuum pressures, pressures, Measurement of pressure by manometers and guages, Buoyancy, Centre of buoyancy, Stability of floating bodies, Metacentre, Meta-centric height and its determination. (06 hrs)

Unit.3

Fluid Kinematic: Types of fluid flows, continuity equation for one , two and three dimensional flows, Velocity and acceleration, Velocity potential function and stream function, vortex flow, flownets, velocity measurements (pitot tube, current meter, hot wire, hot film anemometer, float techniques: laser doppler-velocimetry) (06hrs)

Unit.4

Fluid Dynamics: Equation of motion, Euler's equation, Bernoulli's equation, and practical applications of Bernoulli's equation: Venturi meter, orifice meter, Pitot tube, Momentum equation. Fluid mass subjected to uniform laminar and radial acceleration. Free and forced vortex flow, Radial flow. Mach number, Mach cone, Area – Velocity relationship, Stagnation Properties. (06 hrs)

Unit.5

Measurement of Flow: Orifice, mouth piece, notches, weirs - Classification, Hydraulic coefficients, Determination of hydraulic coefficients, time required to empty a reservoir and tank with triangular/rectangular notch. Ventilation of weir, Proportional Weir or Sutro Weir. (06 hrs)

Unit.6

Flow Through Pipes: Minor losses, Head loss due to friction, Darcy–Weisbatch equation, H.G.L. and T.E.L., Pipes in parallel and series, Equivalent pipe siphon, Power transmission, Water hammer.

Laminar flow: Relation between shear and pressure gradient, Steady laminar flow through circular pipes, Hagens-Poiseuille law, Laminar flow through inclined pipes and between parallel plates, Flow through porous media, Laminar flow around spear. (8 hrs)

TERM WORK:

Term work shall consist of the record of following laboratory experiments.

1. Verification of Bernoulli's equation.
2. Laminar flow by Reynolds Experiment.
3. Discharge measurement by Pitot static tube.
4. Calibration of Venturimeter.
5. Determination of metacentric height
6. Determination of Hydraulic Coefficients for an orifice.
7. Calibration of rectangular / Triangular notch.
8. Study of pressure measuring devices.

REFERENCE BOOKS:

1. Hydraulics and Fluid Mechanics by Modi and Seth, Standard Book House, ISBN:8190089374

2. Fluid mechanics: Fundamentals and Applications, Edition 3 by Yunus A. Cengel and John M. Cimbala, McGraw Hill Education, ISBN : 978-0073380322

3. Theory and Application of Fluid Mechanics by K. Subramanya, Tata McGraw-Hill Publishing Co. Ltd., ISBN : 9780074603697

4. Fluid Mechanics by V.L. Streeter and E. Benjamin Wyle, McGraw- Hill, ISBN: 9780070622326

PCC-CE203	Surveying and Geomatics	L:03, T:0, P:02	Credits: 04

Course Outcomes: At the end of the course the student will be able to

CO1	Define principles of Surveying, Remote Sensing and Geomatics
CO2	Describe different instruments, tools, applications and techniques to determine the positions on the surface of the earth, change detection
CO3	Apply the concepts of modern surveying techniques & instrumentation.
CO4	Differentiate the techniques for setting out alignments, curves, other layouts, modern survey systems etc.
CO5	Formulate basic and modern Surveying, Remote Sensing and Geomatics techniques to be used for a specific civil engineering project

Mapping of course outcomes with programme outcomes

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	3	3	2	2	1	3	3	3	3	1	1	1	-	3	3	--
CO2	3	2	3	3	2	2	2	1	1	2	3	1	-	2	2	--
CO3	3	1	2	1	1	3	1	1	2	3	2	2	2	2	2	2
CO4	3	3	2	2	3	2	3	2	3	2	3	2	-	2	2	1
CO5	3	2	2	3	3	3	3	3	3	2	3	3	-	2	2	3

1: Slightly 2: Moderately 3: Substantially

Unit.1

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

Unit.2

Triangulation and Trilateration: Theodolite survey: Instruments, Measurement of horizontal and vertical angle; Horizontal and vertical control - methods -triangulation -network-Signals. Baseline - choices - instruments and accessories - extension of base lines -corrections -Satellite station -reduction to center – Inter-visibility of height and distances - Trigonometric leveling- Axis single corrections. (8 hrs)

Unit.3

Curves Elements of simple and compound curves ‑ Method of setting out‑Elements of Reverse curve - Transition curve ‑ length of curve ‑ Elements of transition curve -Vertical curves (8 hrs)

Unit.4

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

(8 hrs)

Unit.5

Photogrammetry Surveying: Introduction, Basic concepts, perspective geometry of aerial photograph, relief and tilt displacements, terrestrial photogrammetry, flight planning; Stereoscopy, ground control extension for photographic mapping- aerial triangulation, radial triangulation, methods; photographic mapping- mapping using paper prints, mapping using stereoplotting instruments, mosaics, map substitutes. (8 hrs)

Unit.6

Remote Sensing: Introduction -Electromagnetic Spectrum, interaction of electromagnetic radiation with the atmosphere and earth surface, remote sensing data acquisition: platforms and sensors; visual image interpretation; digital image processing. (8 hrs)

Text/Reference Books:

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

PCC-CE204	**Building Construction**	**L:03, T:0, P:02**	**Credits: 04**

Course Outcomes: At the end of the course the student will be able to

CO1	Enlist the components of a building.
CO2	Understand the role and importance of various building components and its uses.
CO3	Apply properties of various construction materials as per the requirement.
CO4	Analyses and identify the quality materials for construction activity
CO5	Evaluate performance of a building with inclusion of various building services.

Mapping of course outcomes with programme outcomes

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	3	2	--	2	--	1	--	--	2	1	--
CO2	2	1	--	--	--	1	--	--	1	--	--	--
CO3	--	--	2	2	2	1	--	2	--	1	--	1
CO4	--	--	2	1	1	--	2	1	2	--	2	1
CO5	--	1	--	--	1	--	--	1	--	3	--	--

1: Slightly 2: Moderately 3: Substantially

A) Building Components:

Unit.1

Foundations: Loads on buildings**,** Types of shallow foundations and selection criteria, Empirical design f shallow foundations, Foundations in expansive soils (B.C. soil), raft foundations, Types of deep foundations, Timbering of trenches and dewatering of foundations. (03 hrs)
Doors and Windows: Technical terms, Classification and suitability of doors, Types of doors- Framed and Panelled, Flush, Revolving and Collapsible door, Classification and suitability of windows, Fixed, Pivoted, Casement, Louvered window, Fixtures and fastenings for doors and windows. (03 hrs)

Unit.2
Arches and Lintels: Technical terms, Types of arches and lintels, Reinforced concrete lintels with chajja. (03 hrs)
Flooring: Ground and upper floors, Timber floors, concrete floor (IPS), RCC floors, Types of wearing surfaces, modern types ceramic and vitrified tiles. (03 hrs)

Unit.3
Vertical Transportation: Staircases, Technical terms, Requirements of good stair, Classification of stairs, Planning of layout of staircase, Ramps, Elevators/lifts, Escalators. (03 hrs)
Roofs and Roof Covering: Technical terms in sloping roofs, Types of pitched roofs, Lean to roof, Steel trusses, Roof coverings for pitched roof and their selection, Details of fixing of roof coverings, Flat or terrace roofs, Shell roofs, Domes. (03 hrs)

Unit.4
Temporary Support Structures: Formwork/Form/Shuttering, Requirements, Loads on formwork, Shuttering for columns, beams, and slab, Slip formwork, Types and uses of shoring, underpinning, and scaffolding. (03 hrs)
Building Finishes: Plastering: Objective, Mortar and Tools for plastering, Methods of plastering, Use of lath in plastering, Fibrous plaster boards, Types of pointing, White washing, Coloring, Distempering, materials and methods of applying POP and putty to internal and external surfaces, Wall cladding with aluminum sheets. (03 hrs)

B) Building Materials

Unit.5
Classification of Building materials, Study of properties of materials: like durability, reliability, compatibility, and economic characteristics. Surface Finishes-Pointing: types, plastering: materials and types, Paints and Varnishes: types and uses. Bricks and Tiles- Structural Clay products, Classification, Common clay brick, face bricks and tiles, ceramic tiles, paving blocks. Brick masonry, stone masonry and block masonry. (08 hrs)

C) Building Services:

Unit.6
Plumbing and Sanitation: Plumbing services, general principles of drainage, pipes, traps, and sanitary fittings, drainage plans (03 hrs)
Damp and Fire Proofing: Causes, and effects of dampness, Materials and methods of damp proofing, Important consideration in fire protection, Fire resistant materials, General measures of fire safety in buildings (03 hrs)
Ventilation and Air-Conditioning: Definition and necessity, Functional requirements and systems of ventilation and air-conditioning, likely problems (02 hrs)

TERM WORK:

The students would perform following set of practical and drawing assignments

1. Measured drawing of a residential building
2. Drawing building component in AutoCAD (To have hands-on-experience of 2-D feature of the drawing software)
3. About 15 free hand proportionate sketches of various building components on quarter size drawing sheet It is expected that the students should be able to draw various components free hand which would enable him to draw working drawing on site during supervising any construction activity
4. Assignments on topics of modern concepts in building design

REFERENCE BOOKS:

1. Building Construction by B.C. Punmia
2. Building Construction by S.P. Arora and S.P. Bindra
3. Building Construction by Sushil Kumar
4. National Building Code of India. (SP 7)
5. Engineering Materials by Rangwala, Charotar Publication

HMC279	**Civil-Societal and Global Impact**	**L:02, T:0, P:0**	**Credits: 02**

Course Outcomes: At the end of the course the student will be able to

CO1	Define impact which Civil Engineering has on the Society at large and on the global arena.
CO2	Understanding the importance of Civil Engineering in shaping and impacting the world
CO3	Apply engineering design to produce solutions that meet specified needs with global, cultural, social, environmental, and economic factors
CO4	Analyze and design components of various Civil Engineering projects

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	2	2	--	3	--	2	--	--	2	1	--
CO2	3	2	--	--	--	1	--	--	1	--	--	--
CO3	--	--	1	2	3	1	--	2	--	3	--	2
CO4	--	--	1	2	2	--	2	1	2	--	3	2

1: Slightly 2: Moderately 3: Substantially

The course is designed to provide a better understanding of the impact which Civil Engineering has on the Society at large and on the global arena. Civil Engineering projects have an impact on the Infrastructure, Energy consumption and generation, Sustainability of the Environment, Aesthetics of the environment, Employment creation, Contribution

to the GDP, and on a more perceptible level, the Quality of Life. It is important for the civil engineers to realise the impact which this field has and take appropriate precautions to ensure that the impact is not adverse but beneficial.

The course covers:

- 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

Unit.1: Introduction to Course and Overview; Understanding the past to look into the future: Preindustrial 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; (4 hrs)

Unit.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. (3 hrs)

Unit.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. (3 hrs)

Unit.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 non-stationarity; Environmental Metrics & Monitoring; Other Sustainability measures; Innovations and methodologies for ensuring Sustainability. (3 hrs)

Unit.5: Built environment‑Facilities management, Climate control; Energy efficient built environments and LEED ratings, Recycling, Temperature/ Sound control in built 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 (3 hrs)

Unit.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 & Systems (Ex. Lean Construction), contribution of Civil Engineering to GDP, Contribution to employment(projects, facilities management), Quality of products, Health & Safety aspects for stakeholders; Innovationsand methodologies for ensuring Sustainability during Project development; (4 hrs)

Text/Reference Books:

1. Žiga Turk (2014), Global Challenges and the Role of Civil Engineering, Chapter 3 in: Fischinger M. (eds) Performance-Based Seismic Engineering: Vision for an Earthquake
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 Developing World, 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.
12. Brugnach M., Dewulf A., Pahl-Wostl C., Taillieu T. (2008) Toward a relational concept of uncertainty: about knowing too little, knowing too differently and accepting not to know. Ecology and Society 13 (2): 30
13. Butler D., Davies J. (2011). Urban Drainage. Spon. 3rd Ed.
14. Cavill S., Sohail M. (2003) Accountability in the provision of urban services. Proc. ICE. Municipal Engineer 156. Issue ME4 paper 13445, p235-244.
15. Centre for Water Sensitive Cities (2012) Blueprint for a water sensitive city. Monash University.
16. Charles J A. (2009) Robert Rawlinson and the UK public health revolution. Proc ICE Eng History and Heritage. 162 Nov. Issue EH4. p 199-206

BSC261	**Mathematical Foundation for Engineering**	**L:02, T:0, P:0**	**Credits:0** (Audit)

Course Objective:

1. To develop the sound conceptual understanding of Algebra, coordinate geometry, complex numbers , vectors, matrices, Calculus and Differential Equations.
2. To develop the foundation for engineering mathematics and other engineering courses.

Course Outcomes: At the end of the course student will be able to

CO1	analyze the structure of complex numbers, quadratic equations, vectors and matrices and their uses.
CO2	Find the standard and general equations of lines, circles, conic sections, and their properties.
CO3	Sketch the graphs of functions and can evaluate limit, continuity, derivatives, integrations.
CO4	Formulate and solve first order differential equations.

Articulation Matrix

PO ➡ / CO ⬇	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO 1	3	3	1	2								2
CO2	3	3	1	2								1
CO3	3	3										1
CO4	3	3	2									2

Note: 1-Low, 2-Medium or 3- High.

Unit-1 Complex Numbers (05 hours)

Complex numbers as ordered pairs. Argand's diagram. Triangle inequality. Powers and roots of complex numbers, De Moivre's Theorem.

Unit-2 Algebra (05 hours)

Quadratic equations and express-ions. Permutations and Combinations. Binomial theorem for a positive integral index.

Unit-3 Coordinate Geometry (07 hours)

Coordinate Geometry: Locus. Straight lines. Equations of circle, parabola, ellipse and hyperbola in standard forms. Parametric representation.

Unit-4 Vectors and Matrices (08 hours)

Addition of vectors. Multiplication by a scalar. Scalar product, cross product and scalar triple product with geometrical applications. Matrices and Determinants: Algebra of matrices. Determinants and their properties. Inverse of a matrix. Cramer's rule.

Unit-5 Differential Calculus (10 hours)

Function. Inverse function. Elementary functions and their graphs. Limit. Continuity. Derivative and its geometrical significance. Differentiability. Rules of derivatives, Applications of Derivatives: Tangents and Normals, Increasing and decreasing functions. Maxima and Minima

Unit-6 Integral calculus (10 hours)

Integration as the inverse process of differentiation. Integration by parts and by substitution. Definite integral and its application to the determination of areas (simple cases). Solving first order differential equations:Exact differential equations and first order linear differential equations.

References:

1. Bernard and Child, Higher Algebra, Macmillan and Co. Pvt. Ltd, New York.
2. J.V. Uspensky, Theory of equations, macGraw Hill Publications.
3. S. L. Loney, The Elements of Coordinate Geometry, Macmilliams and Co., New York
4. G.B.Thomas, M.D.Weir, J. Hass, Thomas' calculus, 12th edition, Pearson Publications
5. H.Anton, C. Rorrers, Elementary Linear Algebra Applications version, 9th edition, Wiley publications.

SEMESTER - II

BSC274	Mathematics–IV: Statistical and Numerical Methods	L:03, T:0, P:0	Credits: 03

Course Objectives:

1. To provide students with the foundations of probabilistic and statistical analysis mostly used in varied applications in engineering and science.
2. To understand probability distributions and their properties
3. To learn the statistical parameters for different distributions, correlation and regression
4. To understand the method of curve fitting, testing of hypothesis, goodness of fit
5. To understand the interpolation and approximation, Numerical differentiation and numerical integration.
6. To learn various numerical techniques to solve ordinary and partial differential equations.

Course Outcomes: After successful completion of this course student will be able to:

1. To develop techniques of data interpretation.
2. Develop problem solving techniques needed to accurately calculate probabilities and describe the properties of discrete and continuous distribution functions.
3. Use statistical tests in testing hypotheses on data, compute covariances, and correlations, Apply the tests of goodness of fit.
4. Develop the numerical skills for finding roots of polynomial and transcendental equations.
5. Conduct numerical integration and differentiation and solve ODE's and PDE's and engineering problems.

Articulation Matrix

PO ➡ / ⬇ CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO 1	3	3										2
CO2	3	3	2									2
CO3	3	3		3		1						2
CO4	3	3	2	2		1					1	2
CO5	3	3	2	2								2

Note: 1-Low, 2-Medium or 3- High.

Unit 1: Analysis of Statistical Data
Frequency distribution; Frequency curve and histogram; Measure of central tendency and dispersion. (03 hrs)

Unit 2: Random variables and Probability Distributions
Basic concepts of probability and its properties; Conditional probability and independent events; Random variables, discrete and continuous random variables, Mean and variance of Binomial, Poisson and Normal distributions and applications. (08 hrs)

Unit 3: Sampling Distributions and Interval of Estimation
Sampling Distributions: t distribution, Chi-square distribution, F-distribution,; Interval of estimation (08 hrs)

Unit 4: Testing of Hypothesis
Relation between confidence interval and testing of hypothesis; testing of hypothesis, classification of hypothesis tests; large sample tests, small sampe tests. (08 hrs)

Unit 5: Numerical Methods – 1
Solution of polynomial and transcendental equations – Newton-Raphson method and Regula-Falsi method. Finite differences, Interpolation using Newton's forward and backward difference formulae. Interpolation with unequal intervals: Lagrange's formulae. Numerical Differentiation, Numerical integration: Trapezoidal rule and Simpson's 1/3rd and 3/8 rules. (08 hrs)

Unit 6: Numerical Methods – 2
Numerical solutions to differential equations: Taylor series method, Euler method, Runge-Kutta method, predictor-corrector methods for initial value problems, Adams-Moulton method, Numerical solutions to partial differential equations: Finite difference method, Explicit, implicit, Crank-Nicolson method. (10 hrs)

References:

1. E. Kreyszig, *Advanced Engineering Mathematics*, Eighth Edition, John Wiley and Sons, 2015.
2. Steven C. Chapra and Raymond P. Canale, Numerical Methods for Engineers, 7th Edition, McGraw Hill.
3. S.S. Sastry, Introductory Methods of Numerical Analysis, PHI learning Pvt. Ltd.
4. V. K. Rohatgi and A.K. Md. Ehsanes Saleh, An Introduction to Probability and Statistics, 2nd Edition.
5. D. C. Montgomery and G.C. Runger, "Applied Statistics and Probability for Engineers", 5th edition, John Wiley & Sons, (2009).
6. P. S. Mann, Introductory Statistics, Wiley Publications, 7th edition (2013).

PCC-CE205	Theory of Structures – I	L:03, T:1, P:0	Credits: 04

Course Outcomes: At the end of the course the student will be able to

CO1	Recall the concept of deflection, bending moment and shear force diagram in beams, frames, trusses and columns under various loading conditions using different analysis methods.
CO2	Express knowledge to determine forces in determinate and indeterminate structures.
CO3	Apply different analysis methods to obtain shear force, bending moment.
CO4	Calculate different stress variants for the given loading condition on beams, frames, trusses, columns and to perform ILD analysis of determinate beams and trusses.

Mapping of course outcomes with programme outcomes

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	--	1	--	1	1	--	--	--	--	--
CO2	3	3	2	1	--	1	1	--	--	--	--	--
CO3	3	3	2	--	--	1	--	--	--	--	--	--
CO4	3	3	--	1	--	--	1	--	--	--	--	--

1: Slightly 2: Moderately 3: Substantially

Unit.1

Columns: Long columns subjected to eccentric and lateral loads, Columns with initial curvature.

Strain Energy: Strain energy in beams due to bending. Castigliano's theorem I and II and its application to beams and pin jointed trusses, Conjugate beam method. (05 hrs)

Unit.2

Fixed Beams: Analysis of fixed beams, Effect of sinking of supports. (06 hrs)

Unit.3

Continuous Beams: Clapeyron's theorem of three moments, Analysis of continuous beam and frames, Effect of sinking of supports. (07 hrs)

Unit.4

Moving Loads: Maximum bending moment and shear force diagram for simply supported spans transverse by single point load, two concentrated loads and uniformly distributed loads, Equivalent uniformly distributed load. (06 hrs)

Unit.5

Influence Lines: Influence lines for reaction, shear force and bending moment in a simply supported beam. Influence lines for force in member of statically determinate trusses. (08 hrs)

Unit.6

Three Hinged Suspension Bridges: Forces in loaded cables, Length of cables, different support conditions and Simple suspension bridge with three hinged stiffening girder. (08 hrs)

REFERENCE BOOKS:

1. Mechanics of Structures (Vol. II) by S.B. Junnarkar, Charotar Pub. House
2. Basic Structural Analysis by C.S. Reddy, Tata McGraw Hill Publication.
3. Theory of Structures by B.C. Punmia, Ashok Jain and Arun Kumar Jain, Laxmi Publication
4. Mechanics of Material by Beer and Johnson, Tata McGraw Hill Publication.
5. Theory of Structures by S.P. Timoshenko and D.H. Young, McGraw Hill International Publication.

PCC-CE206	**Hydraulic Engineering**	**L:03, T:0, P:02**	**Credits: 04**

Course Outcomes: At the end of the course the student will be able to

CO1	Define the basic concept used in different types of incompressible fluid flow including the working principles of fluid machinery.
CO2	Understand and apply basics related to turbines & pumps in water resources planning.
CO3	Apply various components of fluid flow and comparison of possible solutions.
CO4	Analyzed appropriate concept and apply the same using basic principles for solving incompressible fluid flow problems.

Mapping of course outcomes with programme outcomes

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	3	--	--	2	1	1	--	--	1
CO2	3	2	2	2	2	2	3	2	2	2	2	1
CO3	3	2	3	3	2	2	3	2	3	1	2	2
CO4	2	3	3	3	2	3	2	3	3	2	2	2

1: Slightly 2: Moderately 3: Substantially

Unit.1

Flow in Open Channel: Uniform flow, Chezy's and Manning's equation, Velocity distribution, hydraulically efficient section, Specific energy, Specific force, Critical, Subcritical and supercritical flows, Non-uniform Flow: Energy equation for gradually varied flow, Types of channel slopes, water surface profiles, hydraulic jump, Channel Transitions, Venturi and standing wave flume (07 hrs)

Unit.2

Flow Through Pipes: Turbulent flow through pipes, Prandl's theory, velocity distribution equation for smooth and rough pipe, Mean velocity variation, Friction factor, three reservoir problems, Pipe network analysis by Hardy Cross method, Water hammer, Rigid and elastic water column theories, function and types of surge tanks.

(07 hrs)

Unit.3

Boundary Layer Theory: Concept of boundary layer theory, Thickness of boundary layer, separation of boundary layer, Forces on immersed body in flowing fluid, types of drag, pressure distribution about bluff and stream line body.

(07 hrs)

Unit.4

Dimensional Analysis and Similarity: Dimensions of various physical quantities, Buckingham's–phi theorem. Types of similarities and distorted models, non-dimensional numbers and their significance.

(07 hrs)

Unit.5

Centrifugal Pump: Types, Construction and principle of similarity, pump Characteristics and specific speed under various operation, Conditions of self-priming, selection of pumps under various conditions, Installation and operation of pumps. (06 hrs)

Unit.6

Reciprocating Pumps: Types, Work done, Effect of acceleration and frictional resistance, slip separation in suction and delivery pipes, Air vessel and its function, Multi-cylinder pumps.

Modern Pumps: Drilling and flow estimation, Deep submersible pumps, Monoblock pumps, Jet pumps, Air lift pumps, turbine pumps, Selection of pumps and other hydraulic machineries. (06 hrs)

TERM WORK:

Term work shall consist of the record of the following laboratory experiments. At least eight experiments are to be performed.

1. Determination of coefficient of Venturi flume
2. Calibration of standing wave flume
3. Friction in pipes.
4. Determination of Chezy's and Manning's constants
5. Impact of Jet.
6. Study of Hydraulic jump.
7. Study if Impact of jet.
8. Characteristics of Centrifugal pump.
9. Characteristics on Reciprocating pump.
10. Study of other Hydraulic machines.

REFERENCE BOOKS:

1. Fluid Mechanics by Som and Biswas, Tata McGraw-Hill ISBN: 0-07-463371-6.
2. Theory and Applications of Fluid Mechanics by K. Subramanya, Tata McGraw-Hill Publishing Company Ltd., ISBN : 9780074603697
3. Fluid Mechanics by V.L. Streeter and E. Benjamin Wylie, McGraw-Hill, ISBN: 9780070622326
4. Fluid Mechanics by Robert A. Granger, Dover Publications, ISBN-13: 9780486683560

PCC-CE207	Concrete Technology	L:02, T:0, P:02	Credits: 03

Course Outcomes: At the end of the course the student will be able to

CO1	Recall fundamentals of different constituents of cement and basic properties of building material.
CO2	Understand various factors those will affect quality of fresh as well as hardened concrete
CO3	Apply measures to check the quality of ingredients of concrete at field as well in laboratory.
CO4	Analyses the applications of different types of concrete as per requirement.
CO5	Evaluate the performance of hardened and special concrete.

Mapping of course outcomes with programme outcomes

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	02	03	--	--	--	02	--	**	--	--	--	02
CO2	--	--	02	03	02	--	--	02	--	--	--	--
CO3	--	--	02	--	--	--	--		02	--	02	03
CO4	--	02	03	--	--	02	--	02		--	--	01
CO5	--	01	--	--	--	02	--		02	--	--	01

1: Slightly 2: Moderately 3: Substantially

Unit.1

Introduction: Role of building materials in construction**,** Classification, Properties, grades, advantages and Disadvantageous of Concrete, need of quality control of concrete. (03 hrs)

Unit.2

Cement: Basic properties of cement compounds, Manufacturing Process, Hydration of cement, Physical Chemical properties and Types of cement, structure of cement paste and Testing of cement.

Aggregates: Role of aggregates**,** Classification, Properties of Aggregates (Strength, Particle shape and texture, Specific gravity, Bulk density, Voids, Porosity and Absorption, Bulking of sand, Deleterious substances, Fineness modulus, Maximum size of aggregates, Grading and surfaces area, Gap graded aggregates, Grading limits and Testing of aggregates. (04 hrs)

Unit.3

Water: Effect of quality of mixing water on concrete properties, water for curing of concrete.

Admixtures: Definition, need, types of admixtures Retarders, accelerators, plasticizers, super plasticizers, air entraining agents.
Fresh Concrete: Manufacturing process of Concrete, Workability: Measurement, factors affecting workability, effect of time and temperature on workability, requirements of workability, Segregation and bleeding and harshness. Testing of fresh concrete. (03 hrs)

Unit.4
Hardened Concrete: Strength of concrete, Types, Factors influencing strength, Stress-Strain characteristics of concrete, Shrinkage and temperature effects, Creep, Permeability and Durability of concrete. Destructive and Nondestructive testing of hardened concrete - Rebound hammer test, ultrasonic pulse velocity test

Special Concrete: Lightweight concrete, High-density concrete, Fly ash concrete, Ferro cement, Fiber reinforced concrete, Polymer concrete, Ready mixed concrete, Pumped concrete. (04 hrs)

Unit.5
Concrete Mix Design: Variables in concrete mix design, Concept of mix design, variables in proportion, and statistical quality control of concrete, common terms, Different methods of concrete mix design, Trial and error, ACI method and IS code method, Concrete for ordinary work, light weight concrete, high density concrete, workability, durability and strength requirements. (03 hrs)

TERM WORK:
Term work shall consist of a journal based on the following practicals.
1. **Tests on Cement:** Fineness, Standard consistency, Setting time, Compressive strength, Soundness
2. **Tests on Aggregates:** Bulking of sand, Bulk density, Specific gravity, Finesses modulus, Aggregate crushing and impact values, Flakiness Index, Elongation Index.
3. **Tests on Concrete:** Workability, Slump, Compaction factor, Vee–Bee, Compressive strength, Non Destructive Tests

REFERENCE BOOKS:

1. Concrete Technology by M. L. Gambhir; TMH Publishing Co. New Delhi, 2nd Edition
2. Properties of concrete by A.M. Neville, ELBS Publication, New Delhi 3rd Edition
3. Concrete Technology by M.S. Shetty, S. Chand Publishers, New Delhi
4. Special Publication of ACI on Polymer concrete and FRC.

ESC280	**Building Planning and Computer Aided Drawing**	**L:03, T:0, P:02**	**Credits: 04**

Course Outcomes: At the end of the course the student will be able to

CO1	Identify different building components, their properties, and their applicationsin construction.
CO2	Understand building bye laws as per the requirement of submission, working drawing & building code.

CO3	Apply D.C. rules, Develop basic planning skills, and design residential /public buildings/commercial buildings.
CO4	Analyze and produce 2D drawings of buildings in AutoCAD environment
CO5	Create architectural design of simple residential and public buildings.

Mapping of course outcomes with programme outcomes

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	3	2	--	--	--	1	--	--	--	1	--
CO2	2	2	1	--	1	1	1	--	1	--	--	1
CO3	--	2	3	2	1	2	1	2	1	2	--	--
CO4	--	--	2	3	1	3	2	2	2	1	--	--
CO5	--	--	--	3	2	3	1	2	2	--	--	--

1: Slightly 2: Moderately 3: Substantially

Unit.1

Introduction to Architecture and Building Planning: Sequence of activities in a building project, Functions and role of various agencies: Owner, Architect, Civil Engineer, Structural Engineer, Contractor. Building bye laws of municipal councils and corporations – scope and purpose. (07 hrs)

Unit.2

Principles of Architectural Planning for Buildings: Orientation, aspect, prospect, grouping, circulation, functional relations of different units, roominess, flexibility, privacy, space utilization, sanitation, ventilation, strength and stability of structures, planning of living area, sleeping area, service area, circulations. Planning of residential buildings (07 hrs)

Unit.3

Preparation of Submission and Working Drawing: Line plans and working drawings and submission plans to sanctioning authorities, checklist for planning a building project, site plan, utilities and services, legal documents budget restrictions (07 hrs)

Unit.4

General Principles of Planning of Public Buildings: Educational institutes, markets, banks, hospitals, post offices, community centers, offices, canteens, hostels (06 hrs)

Unit.5

Perspective Drawing: Principles of perspective drawing, parallel and oblique perspective.

Acoustics and Sound Insulation: Characteristics and behavior of sound reflection reverberation of sound - Absorption of sound – Acoustical defects. Acoustical design of halls, sound insulation. (06 hrs)

Unit.6

Modern Concepts in Building Design:

a) Energy Efficiency in Buildings: Introduction to various aspects of energy efficient building design against conventional practices. Energy efficiency in buildings including, sizing and design of passive architectural concepts and cost effectiveness.

b) Concept of Intelligent Building: Use of leading-edge design and technology for development of intelligent facilities from business and environmental considerations. Introduction to the latest IT tools used in designing and implementing intelligent controls considering the needs of occupants, environment, energy usage, and cost effectiveness.

c) Green Building Concepts: Evaluation of sustainable/green buildings based on different rating systems. Introduction to the LEED rating system and energy conservation building codes (ECBC) compliance.

d) Introduction to AutoCAD (07 hrs)

TERM WORK:

It shall consist of following drawings:

1. Planning of residential buildings: Preparation of line plans on graph papers for residential buildings - two assignments on graph papers.
2. Planning of public buildings: Preparation of line plans on graph papers for residential buildings – four assignments on graph papers.
3. Building drawing:
    a. Detailed drawing for one residential building on full imperial drawing sheet.
    b. Detailed drawing for one Public building on full imperial drawing sheets.
4. Perspective Drawing: Concepts and method of drawing for two point perspective view. One assignment on full imperial drawing sheet to understand and practice the principles of perspective drawing.

REFERENCE BOOKS:

1. Building Drawing with Integrated Approach for Built Environment — by Shah M.G., Kale C.M. and Patki S.Y.
2. Building Planning — by Sane Y.S.
3. Building Construction — by Sushil Kumar

ESC281	**Basic Electronics**	**L:01, T:0, P:02**	**Credits: 02**

Course Outcomes: At the end of the course the student will be able to

CO1	Explain the basic concepts of Semiconductor diodes such as p-n junction diode, characteristics and ammeters, DC loadline, Zener diode.
CO2	Solve examples on rectifiers for parameters such as Capacitance, load and source effect, line and load regulations, and circuit current.
CO3	Identify and explain the various current components in a transistor.
CO4	Describe the application of transistors for Current and voltage amplification.
CO5	Sketch, explain and design the amplifier circuit for given specification and analyze them discuss oscillator principles, oscillator types, and frequency stability as it relates to its operation.

Mapping of course outcomes with programme outcomes

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	3	--	1	3	1	1	--	2	--	1	--
CO2	1	2	1	1	2	1	1	2	1	2	1	2
CO3	2	1	3	2	2	1	2	--	1	2	3	3
CO4	2	3	--	1	1	--	3	1	2	1	--	2
CO5	2	1	1	--	2	--	1	--	2	--	1	1

The objective of this Course is to provide the students with an introductory and broad treatment of the field of Electronics Engineering to facilitate better understanding of the devices, instruments and sensors used in Civil Engineering applications. Lab should be taken concurrently. This course emphasizes more on the laboratory/practical use of the knowledge gained from the course lectures.

Unit 1: *Diodes and Applications* covering, Semiconductor Diode - Ideal versus Practical, Resistance Levels, Diode Equivalent Circuits, Load Line Analysis; Diode as a Switch, Diode as a Rectifier, Half Wave and Full Wave Rectifiers with and without Filters; Breakdown Mechanisms, Zener Diode – Operation and Applications; Opto-Electronic Devices – LEDs, Photo Diode and Applications; Silicon Controlled Rectifier (SCR) – Operation, Construction, Characteristics, Ratings, Applications; (03 hrs)

Unit 2*: Transistor Characteristics* covering, Bipolar Junction Transistor (BJT) – Construction, Operation, Amplifying Action, Common Base, Common Emitter and Common Collector Configurations, Operating Point, Voltage Divider Bias Configuration; Field Effect Transistor (FET) – Construction, Characteristics of Junction FET, Depletion and Enhancement type Metal Oxide Semiconductor (MOS) FETs, Introduction to CMOS circuits; (03 hrs)

Unit 3*: Transistor Amplifiers and Oscillators* covering, Classification, Small Signal Amplifiers – Basic Features, Common Emitter Amplifier, Coupling and Bypass Capacitors, Distortion, AC Equivalent Circuit; Feedback Amplifiers – Principle, Advantages of Negative Feedback, Topologies, Current Series and Voltage Series Feedback Amplifiers; Oscillators – Classification, RC Phase Shift, Wien Bridge, High Frequency LC and Non-Sinusoidal type Oscillators; (03 hrs)

Unit 4*: Operational Amplifiers and Applications* covering, Introduction to Op-Amp, Differential Amplifier Configurations, CMRR, PSRR, Slew Rate; Block Diagram, Pin Configuration of 741 Op- Amp, Characteristics of Ideal OpAmp, Concept of Virtual Ground; (03 hrs)

Practicals:

Unit 1: Laboratory Sessions covering, Identification, Specifications, Testing of R, L, C Components (Colour Codes), Potentiometers, Switches (SPDT, DPDT and DIP), Bread Boards and Printed Circuit Boards (PCBs); Identification, Specifications, Testing of Active Devices – Diodes, BJTs, JFETs, MOSFETs, Power Transistors, SCRs and LEDs;

Unit 2: Study and Operation of Digital Multi Meter, Function / Signal Generator, Regulated Power Supply (RPS), Cathode Ray Oscilloscopes; Amplitude, Phase and Frequency of Sinusoidal Signals using Lissajous Patterns on CRO; (CRO);

Unit 3: Experimental Verification of PN Junction Diode Characteristics in A) Forward Bias B) Reverse Bias, Zener Diode Characteristics and Zener Diode as Voltage Regulator, Input and Output Characteristics of BJT in Common Emitter (CE) Configuration, Drain and Transfer Characteristics of JFET in Common Source (CS) Configuration;

Unit 4: Study of Half Wave and Full Wave Rectification, Regulation with Filters, Gain and Bandwidth of BJT Common Emitter (CE) Amplifier, Gain and Bandwidth of JFET Common Source (CS) Amplifier, Gain and Bandwidth of BJT Current Series and Voltage Series Feedback Amplifiers, Oscillation Frequency of BJT based RC Phase Shift, Hartley and Colpitts Oscillators;

Unit 5: Op-Amp Applications – Adder, Subtractor, Voltage Follower and Comparator; Op-Amp Applications – Differentiator and Integrator, Square Wave and Triangular Wave Generation, Applications of 555 Timer – Astable and Monostable Multivibrators;

Unit 6: Truth Tables and Functionality of Logic Gates – NOT, OR, AND, NOR, NAND, XOR and XNOR Integrated Circuits (ICs); Truth Tables and Functionality of Flip-Flops – SR, JK and DFlip-Flop ICs; Serial-In-Serial-Out and Serial-In-Parallel-Out Shift operations using 4-bit/8-bit Shift Register ICs; Functionality of Up-Down / Decade Counter ICs; (15 Sessions)

Text/Reference Books:

1. David. A. Bell (2003), *Laboratory Manual for Electronic Devices and Circuits*, Prentice Hall, India
2. Santiram Kal (2002), Basic Electronics- Devices, Circuits and IT Fundamentals, Prentice Hall, India
3. Thomas L. Floyd and R. P. Jain (2009), *Digital Fundamentals* by Pearson Education,
4. Paul B. Zbar, A.P. Malvino and M.A. Miller (2009), *Basic Electronics – A Text-Lab. Manual*, TMH
5. R.T. Paynter (2009), *Introductory Electronic Devices & Circuits, Conventional Flow Version*, Pearson

MAC277	**Indian Constitution**(mandatory Audit Course)	**L:02, T:0, P:0**	**Credits: Audit**

Course Educational Objectives

CEO1	To understand the basic foundation and the basic law for the governance of our nation, the history and the different types of Constitutions.
CEO2	To understanding the importance and the different aspects of the Constitution. To know and understand the different rights enshrined in the Constitution and understand the rights and duties of the government.
CEO3	To understand the basis and procedure of amendments
CEO4	To know the different aspects of the Union and the State Executive.
CEO5	To know how our country was founded, who founded it, what are our rights are, what life was like, how life has changed, how the rights still apply today.

Course Outcomes

CO1	Student will be able to understand how India has come up with a Constitution which is the combination of the positive aspects of other Constitutions.
CO2	Student will be able to understand the interpretation of the Preamble.
CO3	Student will be able to understand the basics of governance of our nation.
CO4	It helps in understanding the different aspects covered under the different important Articles.
CO5	Student will be able to understand the basic law and its interpretation. Understand the important amendments which took place and their effects.
CO6	Student will be able to understand our Union and State Executive better.
CO7	Student will be able to that along with enjoying the rights one needs to fulfill one's duties.

Contents of the Course

1.	Meaning of the constitution law and constitutionalism. Historical perspective of the Constitution of India. Salient features and characteristics of the Constitution of India
2.	Scheme of the fundamental rights. The scheme of the Fundamental Duties and its legal status
3.	The Directive Principles of State Policy –Its importance and implementation. Federal structure and distribution of legislative and financial powers between the Union and States.
4.	Parliamentary form of Government in India. The constitution powers and status of the President of India.
5.	Amendment of the Constitutional Powers and Procedure. The historical perspectives of the constitutional amendments in India.
6.	Emergency Provisions: National Emergency, President Rule, Financial Emergency.
7.	Local Self Government – Constitutional Scheme in India.
8.	Scheme of the Fundamental Right to Equality. Scheme of the Fundamental Right to certain Freedom under Article 19. Scope of the Right to Life and Personal Liberty under Article 21.

Text Books:

1. Introduction to the Constitution of India by Durga Das Basu (Students Edn.) Prentice-Hall EEE, 19th /20th Edition, 2001.
2. An Introduction to Constitution of India by M. V. Pylee, Vikas Publishing, 2002.