

## **Department of Civil Engineering**

Course outcomes of various courses

### **Engineering Graphics (ECE 151/152) (1<sup>st</sup> sem)**

CO 1: Use various scales for drawing of maps and construct regular figures

CO 2 Draw Orthographic projections of Lines, Planes, and Solids

CO 3: Draw projections of lines, planes, solids, isometric projections and sections of solids including Cylinders, cones, prisms and pyramids using AutoCAD

CO 4: Draw Sections of various Solids including Cylinders, cones, prisms and pyramids

CO 5: Construct Isometric Scale, Isometric Projections and Views

### **Environment and Ecology (ECE 153/154) (2<sup>nd</sup> sem)**

CO 1: Identify environmental problems arising due to engineering and technological activities and the science behind those problems.

CO2: Estimate the population - economic growth, energy requirement and demand.

CO3: Analyze material balance for different environmental systems.

CO4: Realize the importance of ecosystem and biodiversity for maintaining ecological balance.

CO5: Identify the major pollutants and abatement devices for environmental management and sustainable development.

## **3rd Semester**

### **Surveying-I (ECE 253) (Theory and Lab)**

CO1: To analyze the basic concepts of surveying, identifying errors and measurement of distances.

CO 2: To measure angles and directions using compass and theodolite surveying.

CO 3: To apply the concepts of traversing and tacheometry.

CO4: To carry out measurements of elevation and contouring.

CO 5: To carry out plane table surveying and analyze topographical maps

CO 6: Carry out alignment and surveys (measurement of angles, contouring, plane tabling etc) based on the theory course for actual field problems.

### **Building Material and Construction (ECE 251), (Theory and BM Lab)**

CO1 Identify and characterize various building materials

CO2 Analyze cement, mortar, concrete and admixtures

CO3 Analyze building bye-laws and brick masonry

CO4 Analysis of building construction – foundation, floor, roof, slab and other building utilities-lift and escalators.

CO5 Analyze doors, windows and finishes in building.

CO6: Carryout testing on various building materials (cement, aggregates, bricks, steel) and analyze their properties for quality control in construction projects

### **Strength of Materials (EME 201)**

CO1: Analyze and determine stresses in beams under various conditions (shear, bending, tension, compression)

CO2: To analyze and determine stresses and deflections in beams for unsymmetrical conditions

CO3: Analyze the problems of springs (helical and leaf) subjected to various conditions.

CO4: Analyze and evaluate stresses in columns and cylinders under various conditions

CO5: Analyze and determine stress and strain in thin and thick cylinders

### **Mathematics- III (BMA 201)**

CO 1: Apply various transforms to solution of engineering problems

CO 2: Apply complex variables, conformal mapping and transformation to engineering problems

CO 3: Carry out integration of complex mathematical functions

CO 4; To apply concepts of curve fitting and probability for solution of engineering problems

CO 5: Apply statistical methods and related tests for solution of engineering problems

### **Engineering Geology (ECE 255) (Theory and Lab)**

CO 1: Conceptual knowledge of earth science, minerals and their properties

CO 2: Identify various types of rocks and study various properties

CO 3: Analyze and locate dip and fault in various types of rocks formations

CO 4: Apply theoretical knowledge of earthquake, seismic zones and aquifers for solution of practical Civil Engineering problems

CO 5: Perform geological investigations for identifying site selection for dams, tunnels, bridges, highways etc.

CO 6: Identify various rocks and minerals using megascopic study, find dip and fault, and use new techniques (seismic refraction, electrical resistivity) for soil exploration.

## **4<sup>th</sup>Semester**

### **Fluid Mechanics (ECE 252) (Theory and Lab)**

CO1: Analyze fluids properties- viscosity, surface tension, capillary and compute hydrostatic and hydrodynamic forces and pressure measuring devices.

CO 2: Analyzing concept of control volume, eulerian and lagrangian approach and free and forced vortex.

CO 3: Analyze and apply the fluid dynamics, conservation laws and dimensional analysis to solve fluid problems.

CO4: Apply laminar and turbulent flow theory for solution to real life field problems.

CO-5: Analyze losses in pipes, analysis of water supply systems and boundary layer theory.

CO-6 Demonstrate experiments related to fluid statics, dynamics, pipe flow and boundary layer and develop new experiments

### **Structural Analysis-I (4<sup>th</sup>sem) (ECE 254)**

CO1 Analysis of determinacy of structures, influence lines and rolling/moving loads.

CO2 Apply the concept of strain energy and energy theorem

CO 3 Analyze the arches and drawing of influence lines.

CO 4 Analyze suspension bridges and cable structures.

CO5 Apply Plastic analysis of structures.

### **Surveying-II (ECE 258) (Theory and Lab)**

CO1 Analysis of the procedure of Triangulation and identify errors

CO2 Analyze the adjustments and computation of errors and normal equations

CO 3: Analysis of various curves and their methods of setting and study of field astronomy.

CO 4 Analyze and apply the concept of photogrammetry and remote sensing.

CO5: Analysis of the principle of GIS, GPS their applications in Civil Engineering.

CO 6: Carry out field surveys (triangulation, traversing, astronomy) and apply new tools (GIS, GPS) for Civil Engineering applications

### **Computer Oriented Numerical Methods (BMA 206), (Theory and NT Lab)**

CO 1: Apply nonlinear Equations and Simultaneous Linear Equations for solution of Civil Engineering problems

CO 2: Apply concepts of Interpolation, Differentiation and Integration for solution of engineering problems

CO 3: Carry out numerical solution of Ordinary Differential Equations

CO 4: Solve Initial and Boundary value problems and apply them for engineering applications

CO 5: Write and solve equations using Finite Element Method

CO 6: Write and run computer programs using various numerical techniques for solution of engineering problems (heat equation, laplace equation , wave equation etc)

### **Cyber Security(ECS 206)**

CO 1: Understand information, information systems, information security, Cyber Security and Security Risk Analysis.

CO 2: Understand and apply application security, data security, security technology, security threats from malicious software

CO 3: Understand the concepts of security threats to e-commerce applications such as electronic payment system, e-Cash, Credit/Debit Cards etc.

CO 4: Understand and apply Information Security Governance & Risk Management, Security of IT Assets and Intrusion Detection Systems.

CO 5: Understand various types of Security Policies, Cyber Ethics, IT Act, IPR and Cyber Laws in India.

## 5<sup>th</sup> semester

### **HHM/C (ECE 351)(Theory and Lab)**

- CO1: To analyze different types of flows and velocities in Open Channel Flow.
- CO 2: To analyze depth and energy relationship in Open Channel Flow and apply concepts of Gradually Varied Flow
- CO 3: To analyze Rapidly Varied Flow
- CO4: To carry out calculation of Impact of Jet and turbines with hydraulics of mobile bed channels.
- CO 5: To analyze centrifugal pumps and forces on submerged bodies.
- CO 6: To analyze and develop models for real life open channel problems

### **SA-II (ECE 355), (Theory and Lab)**

- CO 1: Analyze propped cantilever and continuous beams
- CO 2: Analyze structure by slope deflection and approximate methods
- CO 3: Analyze continuous beams and rigid frames using Moment distribution and Kani's method
- CO 4: Analyze indeterminate structures and redundant trusses
- CO 5: Apply force and displacement method for analysis of beams, trusses and frames
- CO 6: Demonstrate application of Structure analysis for analyzing beams, frames, arches, trusses and bridges etc

### **Design of Concrete structures-I (ECE 256), (Theory and Lab)**

- CO1 Analysis of the properties of concrete and steel
- CO 2 Analysis of various types of special concrete
- CO 3 Introduction to loads, working stress method and design of beams.
- CO 4 Limit state design of singly and doubly reinforced and flanged beams
- CO 5 Design of curved and continuous beams
- CO6 Demonstrate various quality control tests on concrete and use NDT for structures

### **Transportation Engineering-I (ECE 359), (Theory and Lab)**

- CO1 Planning and geometric design of highway and design of horizontal and vertical curves
- CO2 Carry out traffic studies and design of traffic signals at Intersections
- CO 3 Analyze various types of pavement materials
- CO 4 Design of flexible and rigid pavements.
- CO5 Analyze various methods of road construction
- CO6 Demonstrate various quality control test on aggregates and bitumen and carryout traffic studies for site conditions

### **Geotech Engineering-I (ECE 353), (Theory and Lab)**

- CO 1 Identify Physical properties and characterize soil
- CO 2 Classify soil and compute seepage through soil for field conditions
- CO 3 Carryout seepage analysis and locate seepage lines in earth dams

- CO 4 Analyze stress distribution in soils and estimate contact pressure over base of footing
- CO 5 Identify shear strength parameters and stability of slopes for field conditions
- CO6 Demonstrate geotechnical investigations for real life field problems

### **Design of Concrete Structures-II (ECE 357)**

- CO1 Able to design one way and two way slabs
- CO2 Able to design flat and circular slabs
- CO 3: Able to design Columns under axial and bending
- CO 4: Able to design Shallow footing-isolated and combined footing and understand the concept of design of deep foundation
- CO 5: Analyze simple pre-stressed rectangular and flanged sections

## **6<sup>th</sup> Semester**

### **HIE (ECE 356)**

- CO 1 Analyze Precipitation and its abstractions and forecast rainfall.
- CO 2 Analyze streamflow and runoff; develop rainfall-runoff models and hydrographs
- CO 3: Estimate the water requirement of various crops and assess irrigation efficiency
- CO4: Design canals using graphical and analytical methods and develop methods for control of water logging
- CO5: Analyze the groundwater yield and carryout flood forecasting and routing for real life field problems.

### **Environmental Engineering-I (ECE 358) (Theory and Lab)**

- CO1 Identification of water sources and assessing the water demand for planning and design of water supply systems
- CO2 Planning and design of conduits for transmission of water from source to treatment plants
- CO3: Design of various units of water treatment plants and study of new purification methods
- CO4: Identification/Planning and design of water supply systems
- CO5: Planning and design of Plumbing in residential buildings, preparation of DPR for water supply systems.
- CO6: Demonstrate the physical, chemical and bacteriological tests on water samples

### **Geotechnical Engineering-II (ECE 360)**

- CO1 Analysis of the concept of soil improvement, compaction and earth pressure theories for solution of field problem.
- CO2 Application of soil exploration in field
- CO3 Estimate the bearing capacity for shallow foundations.
- CO4 To study, analyze and design pile foundations
- CO5 Analysis of the concept, stability and design of retaining walls.

### **Transportation Engineering-II (ECE 354)**

- CO1 Gain knowledge about Indian Railways, tracks, ballast and various gauges
- CO2 Analyze the track geometry and design curves
- CO3 Gain knowledge about laying of tracks, yards, railways stations,
- CO4 Apply the concept of airport planning and design for runway design
- CO5 Gain knowledge about planning and construction of tunnels, docks and harbour

### **Design of Steel Structures (ECE 352)(Theory)**

- CO1: To analyze load combinations, design philosophies and design of fasteners
- CO 2: To carry out designing of compression members
- CO 3: To carry out design of Tension members and column bases
- CO4: To carry out design of beams and gantry girders
- CO 5: To analyze wind loads and designing of industrial buildings with focus on roof trusses.
- CO 6: Design, Drawing and detailing of RCC and steel structures

### **7<sup>th</sup> Semester**

### **Estimation and Construction Management (ECM) (ECE 401)**

- CO1 Prepare quantity estimates for buildings and roads
- CO2 Carry out rate analysis and prepare specifications for various civil construction items
- CO 3 Analyze contracts and carry out valuation of civil infrastructure.
- CO 4 Applying techniques of construction management and apply PERT and CPM to construction projects.
- CO 5 Application of various construction equipment- earth moving, drilling etc.

### **Environmental Engineering-II (ECE 403) (Theory and Lab)**

- CO1: To analyze various characteristics of wastewater and factors of effluent disposal
- CO 2: Analysis and design of wastewater collection system
- CO 3: Designing of wastewater treatment systems
- CO4: To analyze the concepts of secondary and tertiary treatment of sewage & sludge treatment
- CO 5: Analysis of solid waste management and air pollution control.
- CO 6: Analyze and demonstrate the quality of wastewater sample and develop related field investigations

### **Hydraulic Structures (ECE 362)**

- CO1 Planning and hydraulic design of diversion headworks, canal headwork and river training works
- CO2 Planning and design of canal regulation works-falls, outlets and cross drainage works
- CO3 Understand the planning and design of dams and reservoirs and the concept

of flood routing

CO 4 Analysis and design of gravity and earth dams

CO 5 Understand the hydraulic design of spillways and assessment of hydropower potential

### **Transportation System Planning (ECE 459), Elective I**

CO 1 Gain understanding of transportation system planning

CO 2 Gain awareness about various transportation systems and carry out traffic flow analysis

CO 3: Estimate travel demand using quantitative and regression methods

CO 4: Evaluate transport planning proposals based on technical and financial criteria

CO 5: Plan and design various Transportation facilities such as pedestrian, bicycle, parking, terminal and understand use of IT in Transportation

### ***Elective -II***

#### **Advanced Concrete Technology (ECE 464)**

CO 1: To understand the fundamentals of concrete technology-mixing, curing, admixtures for improving the performance of concrete

CO 2: Learn about concept of durability in concrete with focus on physically and chemically aggressive environment..

CO 3: Learn the methods for special concrete such as mass, self- compacting, light weight, fibre reinforced, flash, polymer, high performance etc.

CO 4: Learn special construction methods such as roller compaction, shotcreting, antiwash out concreting etc.

CO 4: Learn repair, rehabilitation and life cycle costing of structures

#### **Practical Training (ECE 461)**

CO1 :Gain understanding about various organizations/industry involved in Civil Engineering profession.

CO 2: Adjust to the site conditions of Civil Engineering Construction projects

CO3 :Learn about various works at site and try to relate with the subjects studied up to 3<sup>rd</sup> year.

CO 4: Prepare a technical Report and learn editorial skills, reference writing skills etc.

CO 5: To develop confidence for speaking and replying related queries before an audience

#### **Seminar/Colloquium (ECE 471)**

CO1 : To carry out literature review pertaining to a given topic related to Civil Engineering

CO2 : To demonstrate a particular topic of civil engineering and its details

CO3 : To develop confidence for speaking and replying related queries before an audience

CO4 : Develop technical writing skills and prepare a Seminar report

CO 5: Demonstrate editorial skills, reference writing skills etc.

## 8<sup>th</sup> semester

### *Elective -III*

#### **Traffic Engineering (ECE 460)**

- CO 1: Analyze the traffic characteristics under heterogeneous conditions.
- CO 2: Plan and design of capacity of highway. Transit system and use of Queuing Theory
- CO 3: Analysis of traffic volume, speed, delay, origin and destination, accident, capacity and parking studies
- CO 4: Design of traffic signals and street lightings
- CO 5: Design of intersections and parking facilities

### *Elective -IV*

#### **Structural Fire Engineering (ECE 463)**

- CO 1: Gain understanding about fire loads and ventilation effects.
- CO 2: Gain understanding about fire resistant tests.
- CO 3: Gain knowledge about fire safety- protection for openings, material selection and site planning.
- CO 4: Gain knowledge about fire protection in tall buildings
- CO 5: Gain knowledge about architectural fire safety measures

#### ***B.Tech Project (ECE 498)***

- CO 1: Review the available literature on the chosen problem and identify gaps
- CO 2: Formulate the methodology to solve the identified problem
- CO 3: Able to collect, process and analyze primary and secondary data
- CO 4: Apply the principles, tools and techniques to solve the problem
- CO5: Develop technical writing skills and prepare a Seminar report thereby demonstrate editorial skills, reference writing skills etc.
- CO 6 Work in a team to select a problem for project work
- CO7: To develop confidence for speaking and replying related queries before an audience