Course Outcomes

Savitribai Phule Pune University

Syllabus for SE (Civil Engineering) 2019 course

(To be implemented from June 2020)

SEM-I

1. 201001: Building Technologies and Architectural Planning

On completion of the course, learner will be able to:

1. Identify types of building and basic requirements of building components.
2. Make use of Architectural Principles and Building byelaws for building construction
3. Plan effectively various types of Residential Building forms according to their utility, functions with reference to National Building Code.
4. Plan effectively various types of Public Buildings according to their utility functions with reference to National Building Code.
5. Make use of Principles of Planning in Town Planning, Different Villages and Safety aspects.
6. Understand different services and safety aspects.

2. 201002: Mechanics of Structures

On completion of the course, learner will be able to:

1. Understand concept of stress-strain and determine different types of stress, strain in determinate, indeterminate homogeneous and composite structures.
2. Calculate shear force and bending moment in determinate beams for different loading conditions and illustrate shear force and bending moment diagram.
3. Explain the concept of shear and bending stresses in beams and demonstrate shear and bending stress distribution diagram.
4. Use theory of torsion to determine the stresses in circular shaft and understand concept of Principal stresses and strains.
5. Analyze axially loaded and eccentrically loaded column.
6. Determine the slopes and deflection of determinate beams and trusses

3. 20100: Fluid Mechanics

At the end of the course, the learners will be able

1. Understand the use of Fluid Properties, concept of Fluid statics, basic equation of Hydrostatics, measurement of fluid pressure, buoyancy & floatation and its application for solving practical problems.
2. Understand the concept of fluid kinematics with reference to Continuity equation and fluid dynamics with reference to Modified Bernoulli's equation and its application to practical problems of fluid flow
3. Understand the concept of Dimensional analysis using Buckingham's π theorem, Similarity & Model Laws and boundary layer theory and apply it for solving practical problems of fluid flow.
4. Understand the concept of laminar and turbulent flow and flow through pipes and its application to determine major and minor losses and analyze pipe network using Hardy Cross method.
5. Understand the concept of open channel flow, uniform flow and depth-Energy relationships in open channel flow and make the use of Chezy's and Manning's formulae for uniform flow computation and design of most economical channel section.
6. Understand the concept of gradually varied flow in open channel and fluid flow around submerged objects, compute GVF profile and calculate drag and lift force on fully submerged body

4. 207001: Engineering Mathematics III

Course Outcomes: At the end of this course, students will be able to

1. Solve higher order linear differential equations and its applications to modelling and analysing Civil engineering problems such as bending of beams, whirling of shafts and mass spring systems.
2. Solve System of linear equations using direct & iterative numerical techniques and develop solutions for ordinary differential equations using single step & multistep methods applied to hydraulics, geotechnics and structural systems.
3. Apply Statistical methods like correlation, regression and probability theory in data analysis and predictions in civil engineering.
4. Perform Vector differentiation &integration, analyze the vector fields and apply to fluid flow problems.

5. Solve Partial differential equations such as wave equation, one and two dimensional heat flow equations.

5. 207003: Engineering Geology

Course Outcomes: After successful completion of course, students will be able to :

1. Explain about the basic concepts of engineering geology, various rocks, and minerals both in lab and on the fields and their inherent characteristics and their uses in civil engineering constructions. 2. Exploring the importance of mass wasting processes and various tectonic processes that hampers the design of civil engineering projects and its implications on environment and sustainability.
2. Recognize effect of plate tectonics, structural geology and their significance and utility in civil engineering activities
3. Incorporate the various methods of survey, to evaluate and interpret geological nature of the rocks present at the foundations of the dams, percolation tanks, tunnels and to infer site / alignment/ level free from geological defects.
4. Assess the Importance of geological nature of the site, precautions and treatments to improve the site conditions for dams, reservoirs, and tunnels.
5. Explain geological hazards and importance of ground water and uses of common building stones

6. 201007 Awareness to Civil Engineering Practices Audit Course I

On completion of the course, learner will be able to…

1. Describe functioning/working of different types of industries/sectors in Civil Engineering.
2. Describe drawings and documents required and used in different Civil Engineering works.
3. Understand the importance of Code of Ethics to be practiced by a Civil Engineer and also understand the duties and responsibilities as a Civil Engineer.
4. Understand different health and safety practices on the site.

7. 201007 Road Safety Management Audit Course I

Course Outcomes: On completion of the course, learners will be able to…

1. Summarize the existing road transport scenario of our country

2. Explain the method of road accident investigation

3. Describe the regulatory provisions needed for road safety

4. Identify the safety issues for a road and make use of IRC's road safety manual for

conducting road safety audit.

SEM-II

8. 201008 Geotechnical Engineering

On completion of the course, learner will be able to,

1. Identify and classify the soil based on the index properties and its formation process
2. Explain permeability and seepage analysis of soil by construction of flow net.
3. Illustrate the effect of compaction on soil and understand the basics of stress distribution.
4. Express shear strength of soil and its measurement under various drainage conditions.
5. Evaluate the earth pressure due to backfill on retaining structures by using different theories.
6. Analysis of stability of slopes for different types of soils.

9. 201009 Surveying

On successful completion of this course, Student will be able to:

1. Define and Explain basics of plane surveying and differentiate the instruments used for it.
2. Express proficiency in handling surveying equipment and analyse the surveying data from theseequipment.
3. Describe different methods of surveying and find relative positions of points on the surface ofearth.
4. Execute curve setting for civil engineering projects such as roads, railways etc.
5. Articulate advancements in surveying such as space based positioning systems
6. Differentiate map and aerial photographs, also interpret aerial photographs

10. 201010 Concrete Technology

1. Able to select the various ingredients of concrete and its suitable proportion to achieved desiredstrength.
2. Able to check the properties of concrete in fresh and hardened state.
3. Get acquainted to concreting equipments, techniques and different types of special concrete.

4. Able to predict deteriorations in concrete and get acquainted to various repairing methods andtechniques

11. 201011: Structural Analysis

On completion of the course, learner will be able to:

1. Understand the basic concept of static and kinematic indeterminacy and analysis of indeterminate beams.
2. Analyze redundant trusses and able to perform approximate analysis of multi-story multi-bayframes.
3. Implement application of the slope deflection method to beams and portal frames.
4. Analyze beams and portal frames using moment distribution method.
5. Determine response of beams and portal frames using structure approach of stiffness matrixmethod.
6. Apply the concepts of plastic analysis in the analysis of steel structures.

12. 201012 Project Management

On completion of the course, student will:

1. Describe project life cycle and the domains of Project Management.
2. Explain networking methods and their applications in planning and management
3. Categorize the materials as per their annual usage and also Calculate production rate ofconstruction equipment
4. Demonstrates resource allocation techniques and apply it for manpower planning.
5. Understand economical terms and different laws associated with project management

   Apply the methods of project selection and recommend the best economical project

13. 201017 Project Based Learning

After completion of course the students will be able to

1. Identify the community/ practical/ societal needs and convert the idea into a product/ process/service.
2. Analyse and design the physical/ mathematical/ ICT model in order to solve identifiedproblem/project.

3. Create, work in team and applying the solution in practical way to specific problem

Syllabus for TE Civil Engineering (2019 Pattern)

Implemented from Academic year 2021-22

SEM-I

Course Outcomes

1. 301001: Hydrology and Water Resource Engineering

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

01 Understand government organizations, apply & analyze precipitation & its abstractions.

02 Understand, apply & analyze runoff, runoff hydrographs and gauging of streams.

03 Understand, apply & analyze floods, hydrologic routing & Q-GIS software in hydrology.

04 Understand, apply & analyze reservoir planning, capacity of reservoir & reservoir economics.

05 Understand water logging & water management, apply & analyze ground water hydrology

06 Understand irrigation, piped distribution network and canal revenue, apply and analyze crop water requirement.

2. 301002: Water Supply Engineering

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

01 Define identify, describe reliability of water sources, estimate water requirement for various sectors

02 Ascertain and interpret water treatment method required to be adopted with respect to source and raw water characteristics

03 Design various components of water treatment plant and distribution system.

04 Understand and compare contemporary issues and advanced treatment operations and process available in the market, including packaged water treatment plants.

05 Design elevated service reservoir capacity and understand the rainwater harvesting.

06 Understand the requirement of water treatment plant for infrastructure and Government scheme.

3. 301003: Design of Steel Structures

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

01 Demonstrate knowledge about the types of steel structures, steel code provisions and design of the adequate steel section subjected to tensile force.

02 Determine the adequate steel section subjected to compression load and design of built up columns along with lacing and battening.

03 Design eccentrically loaded column for section strength and column bases for axial load and uniaxial bending.

04 Design of laterally restrained and unrestrained beam with and without flange plate using rolled steel section.

05 Analyze the industrial truss for dead, live and wind load and design of gantry girder for moving load.

06 Understand the role of components of welded plate girder and design cross section for welded plate girder including stiffeners and its connections.

4. 301004: Engineering Economics and Financial Management

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

01 Understand basics of construction economics.

02 Develop an understanding of financial management in civil engineering projects.

03 Prepare and analyze the contract account.

04 Decide on right source of fund for construction projects.

05 Understand working capital and its estimation for civil engineering projects.

06 Illustrate the importance of tax planning & understand role of financial regulatory bodies

5. 301005 a: Elective I: Advanced Fluid Mechanics and Hydraulic Machines

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

01 Determine discharge using notches and weirs, and energy loss in hydraulic jump in open channel flow.

02 Describe simple superpositions of basic ideal fluid flows; and determine velocity and shear stress distribution for laminar flow between parallel plates.

03 Understand flow through openings under varying head, and determine rise in pressure due to water hammer effect in pipe flow.

04 Calculate force exerted by free jet on stationary and moving, flat and curved vanes using impulse momentum principle.

05 Design Pelton wheel and Francis turbines and predict their performance characteristics.

06 Estimate performance characteristics of Centrifugal pump

6. 301005 b: Elective I: Research Methodology and IPR

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

01 Understand a research problem for civil engineering domain.

02 Analyze the available literature for given research problem and illustrate different techniques of literature survey thereby gap identification.

03 Recognize the importance of data collection and investigate the statistical and reliability methods of preliminary data analysis.

04 Explain the important concept of interpretation and develop technical writing and presentation skills.

05 Comprehend the various forms of the intellectual property, its relevance and business impact in the changing global business environment.

06 Realize the importance of patents, trademark and copyright and follow research ethics.

7. 301005 c: Elective I: Construction Management

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

01 Understand the overview of construction sector.

02 Illustrate construction scheduling, work study and work measurement.

03 Acquaint various labor laws and financial aspects of construction projects.

04 Explain elements of risk management and value engineering.

05 State material and human resource management techniques in construction.

06 Understand basics of artificial intelligence techniques in civil engineering.

8. 301005 d: Elective I: Advanced Concrete Technology

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

01 Understand the chemistry of cement and its effect on properties of concrete

02 Apply the knowledge of supplementary cementitious materials to produce sustainable concretes

03 Understand the mechanism of working of admixtures and their effect on properties of concrete

04 Evaluate the characteristic properties of fiber reinforced concrete

05 Understand the durability properties of concrete

06 Interpret the properties of concrete through advance testing methods

9. 301005 e: Elective I: Matrix Methods of Structural Analysis

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

01 To understand the structural behavior of bars and trusses and analyze it by using Flexibility method of analysis.

02 To understand the structural behavior of beams and plane frames and analyze it by using flexibility method of analysis.

03 To analyze bars, springs and truss by member approach of stiffness matrix method.

04 To analyze beams by member approach of stiffness matrix method and to develop transformation matrix and global/structure stiffness matrix for plane frame and thereby analyze it by member approach of stiffness matrix method.

05 To develop transformation matrix and global/structure stiffness matrix for grid and analyze the grid by structure and member approach of stiffness matrix method.

06 To develop the member stiffness matrix of space truss and space frame and develop the flow chart /algorithm to write the program for analysis of skeletal structures with reference to computer application.

10. 301005 f: Elective I: Advanced Mechanics of Structures

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

01 Apply moment area and conjugate method to find slope and deflection.

02 Evaluate stresses and strain in thin and thick cylinder.

03 Analyze the beam and trusses by influence line diagram.

04 Analyze the beam for moving load by influence line diagram.

05 Understand and analyze beam curved in plan and elevation.

06 Analyze three and two hinged arches for axial thrust, shear and moment.

11. 301006: Seminar

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

01 Appraise the current civil engineering research / techniques / developments /

interdisciplinary areas.

02 Review and organize literature survey utilizing technical resources, journals etc.

03 Evaluate and draw conclusions related to technical content studied.

04 Demonstrate the ability to perform critical writing by preparing a technical report.

05 Develop technical writing and presentation skills.

SEM-II

12. 301011 a: Audit Course I: Professional Ethics and Etiquettes

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

01 Understand the basic perception of profession, professional ethics, various moral issues and uses of ethical theories

02 Understand various social issues, industrial standards, code o ethics and role of professional ethics in engineering field.

03 Follow ethics as an engineering professional and adopt good standards and norms of engineering practice.

04 Apply ethical principles to resolve situations that arise in their professional lives

13. 301011 b: Audit Course I: Sustainable Energy Systems

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

01 To demonstrate an overview of the main sources of renewable energy.

02 To understand benefits of renewable and sustainable energy systems.

14. 301012: Waste Water Engineering

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

01 Recall sanitation infrastructure, quantification and characterization of wastewater, natural purification of streams

02 Design preliminary and primary unit operations in waste water treatment plant

03 Understand theory and mechanism of aerobic biological treatment system and to design activated sludge process

04 Understand and design suspended and attached growth wastewater treatment systems

05 Explain and apply concept of contaminant removal by anaerobic, tertiary and emerging wastewater treatment systems

06 Compare various sludge management systems and explain the potential of recycle and reuse of wastewater treatment

15. 301013: Design of Reinforced Concrete Structures

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

01 Apply relevant IS provisions to ensure safety and serviceability of structures, understand the design philosophies and behavior of materials: steel & concrete.

02 Recognize mode of failure as per LSM and evaluate moment of resistance for singly, doubly rectangular, and flanged sections.

03 Design & detailing of rectangular one way and two-way slab with different boundary conditions

04 Design & detailing of dog legged and open well staircase

05 Design & detailing of singly/doubly rectangular/flanged beams for flexure, shear, bond and torsion.

06 Design & detailing of short columns subjected to axial load, uni-axial/bi-axial bending and their footings.

16. 301014: Remote Sensing and Geographic Information System

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

01 Articulate fundamentals and principles of RS techniques.

02 Demonstrate the knowledge of remote sensing and sensor characteristics.

03 Distinguish working of various spaces-based positioning systems.

04 Analyze the RS data and image processing to utilize in civil engineering

05 Explain fundamentals and applications of RS and GIS

06 Acquire skills of data processing and its applications using GIS

17. 301015 a: Elective II: Advanced Engineering Geology with Rock Mechanics

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

01 Illustrate seismic zones, plate tectonics and civil engineering significance of major rock formations of India with their characteristics.

02 Explain soil profile, geo-hydrological characters of various rock formations and necessity of geological studies in water conservation.

03 Apply knowledge of geology in Infrastructural, Urban development and demonstrate importance of national wealth.

04 Validate the suitability of rocks based on mechanical properties, R.Q.D. and geophysical exploration.

05 Explore subsurface Geology for civil engineering projects to suggest foundation treatments for various geological defects and channel erosion.

06 Illustrate the suitability of proposed alignments for tunnels and bridges on the basis of Geological investigations.

18. 301015 b: Elective II: Soft Computing Techniques

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

01 Understand AI techniques, soft computing techniques and basic concepts Artificial Neural Network

02 Understand components of ANN, training algorithms and implement the back propagation algorithm

03 Design the feed forward back propagation neural network.

04 Understand types of neural networks and their applications

05 Understand working of genetic algorithm, support vector regressions, model tree and random forest along with their applications

06 Develop models for time series applications using support vector regressions, model tree and random forest.

19. 301015 c: Elective II: Advanced Surveying

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

01 Recognize the concept of triangulation for fixing the ground control points.

02 Differentiate most probable values for different measurement and adjust those in a given figure.

03 Summarize the concepts of astronomical and hydrographic surveying.

04 Demonstrate the use of aerial photographs for mapping.

05 Analyze use of modern surveying instruments in the field.

06 Execute GPS and the associated software for different applications in civil engineering.

20. 301015 d: Elective II: Advanced Geotechnical Engineering

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

01 Classify the soil and understand the soil structure and role of water in clay.

02 Calculate lateral pressure on retaining structures and carry out design the retaining structures.

03 Interpret the results of triaxial tests under different drainage conditions.

04 Draw the stress paths for different conditions.

05 Select and implement soil stabilization techniques based on field conditions.

06 Explain different ground improvement techniques.

21. 301015 e: Elective II: Architecture and Town Planning

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

01 Apply the principles of architectural planning and landscaping for improving quality of life

02 Understand the confronting issues of the area and apply the acts.

03 Evaluate and defend the proposals.

04 Appraise the existing condition and to develop the area for betterment.

22. 301015 f: Elective II: Solid Waste Management

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

01 Outline solid waste management systems with respect to its generation rate (quantity), sampling, characteristics and regulatory/legal requirements.

02 Explain and suggest relevant method of storage, collection and transportation of solid waste for the given site condition with justification.

03 Develop understanding of technological applications for processing and material recovery from solid waste with its economics and design composting system for organic waste.

04 Describe the fundamental and technological aspects of waste to energy systems from solid waste and to design anaerobic digester and incineration system.

05 Outline the design, operation, and maintenance of sanitary landfill and management of

legacy waste.

06 Explain the functional element for management of special waste and suggest the relevant method of reuse and recycling for the given type of waste in the given situation.

23. 301016: Internship

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

01 To develop professional competence through industry internship

02 To apply academic knowledge in a personal and professional environment

03 To build the professional network and expose students to future employees

04 Apply professional and societal ethics in their day to day life

05 To become a responsible professional having social, economic and administrative considerations

06 To make own career goals and personal aspirations

Syllabus for BE Civil Engineering (2019 Pattern)Implemented from Academic year 2022-23

SEM-I

1. **401001: Foundation Engineering**

On successful completion of this course, the learner will be able to,

01 Perform subsurface investigations for foundations using different methods.

02 Estimate the bearing capacity of shallow foundations.

03 Calculate immediate and primary consolidation settlement of shallow foundations.

04 Decide the capacity of a pile and pile group.

05 Understand the steps in geotechnical design of shallow foundations and well foundations.

06 Analyze problems related to expansive soil and overcome them using design principles,
construction techniques in black cotton soil.

2. **401002: Transportation Engineering**

On successful completion of this course, the learner will be able to,

01 Understand principles and practices of transportation planning.

02 Demonstrate knowledge of traffic studies, analysis and their interpretation.

03 Design Geometric Elements of road pavement.

04 Evaluate properties of highway materials as a part of road pavement.

05 Appraise different types of pavements and their design.

06 Understand the fundamentals of Bridge Engineering and Railway Engineering.

3. **401003 a Elective III: Coastal Engineering**

On successful completion of this course, the learner will be able to,

01 Understand basic of ocean waves including wave generation, classification, propagation, wave theories, wave diffraction, wave refection and wave breaking.

02 Understand and apply short term and long-term wave analysis.

03 Understand basic characteristics of tides, tide producing forces, dynamic theory of tides.

04 Understand coastal process of erosion/accretion due to waves, bed forms, long shore transport (Littoral drift) and estimation of wave induced sediment quantity.

05 Understand the coastal structures and shore protection methods.

06 Understand coastal zone management activities, issues related to integrated coastal zone management and regulation of coastal zone.

4. 401 003 b Elective III: Advanced Design of Concrete Structures

On successful completion of this course, the learner will be able to,

01 Understand yield line theory and apply it to analyze and design slabs of different shapes having different edge conditions.

02 Understand the concepts of ductile detailing

03 Analyze and design of flat slab.

04 Analyze and design of retaining walls.

05 Analyze and design of liquid retaining structures.

06 Analyze and design of RC frames and shear walls.

5. 401 003 c Elective III: Integrated Water Resources Planning and Management

On successful completion of this course, the learner will be able to,

01 Understand concerned organizations, IWRP & M objectives, principles, challenges, application & analysis of IWRP&M approaches & principles in a case study.

02 Understand PIM, WDS, WALMI, agriculture in the concept of integrated water resources, apply and analyse water requirements for food production

03 Understand assessment of surface and ground water quality,EIA, CPCB regulations, application & analysis of effluent quality standards as per CPCB

04 Understand water economics and funding, application & analysis of planning for a sustainable water future

05 Understand legal regulatory settings of IWRP & M, application & analysis of inter-basin water transfers and IWRP & M

06 Understand flood control & power generation for IWRP & M, application QIGIS for analysis of a basin for IWRP & M

6. 401 003 d: Elective III: Finite Element Method

On successful completion of this course, the learner will be able to,

01 To understand the basics of solid mechanics prior to learn finite element analysis.

02 Solve simple Engineering problems using 1D, 2D and 3D elements

03 Write shape functions of 1D, 2D and 3D elements

04 Determine the stresses in three dimensional finite elements using isoparametric formulation.

05 Analyze the truss and beam elements using stiffness matrix and finite element procedure.

06 Evaluate the forces and stresses in rigid jointed portal frame and grid elements using stiffness matrix and finite element procedure.

7. 401003 e Elective: Data Analytics

On successful completion of this course, the learner will be able to,

01 Understand the basic concepts of Statistics and its analysis and applications

02 Solve the problems related to probability and various probability distributions.

03 Apply the concept of sampling and distribution and interpret problems using correlation

04 Analyze and test of hypothesis

05 Examine and prepare the data and use develop regression

06 Understand and Apply machine learning algorithms for Regression, Classification and Clustering.

8. 401003 f Elective III: Operation Research

On successful completion of this course, the learner will be able to,

01 Correlate applications of Operations Research in Civil Engineering field

02 Solve the problems related to stochastic programming

03 Optimize transportation and assignment problems

04 Optimize linear problems

05 Optimize non-linear problems

06 Suggest solution for the problems related to dynamic models, games theory and replacement of items.

9. 401 004 a Elective IV: Air Pollution and Control

On successful completion of this course, the learner will be able to,

01 Recall air pollution, legislation and regulations.

02 Evaluate air pollutant concentrations as a function of meteorology.

03 Interpret sampling results with prescribed standards.

04 Assess emission inventory and air quality models.

05 Compare the air pollution control equipments.

06 Infer indoor air pollution and its mitigation.

10. 401 004 b Elective IV: Advanced Design of Steel Structures

At the end of the course, the learners will be able to

1. Understand the behavior and design of members subjected to combined forces
2. Design moment resisting connection
3. Design component / structure using cold form light gauge section
4. Design members of truss and scaffolding using tubular section
5. Design castellated beam
6. Analyze and design components of industrial structure such as Portal frame and gable frame

11. 401 004 c Elective IV: Statistical Analysis and Computational Methods

On successful completion of this course, the learner will be able to,

01 Understand the basic concepts of Statistics and perform statistical data analysis

02 Understand the concept of probability and fit Binomial, or Poisson or Normal distribution to thegiven data

03 Understand concept of sampling and perform chi-square test, z test, Student T test

04 Perform hypothesis test

05 Carry out correlation and regression analysis for the given data

06 Calculate variance and perform K-S test for goodness of fit.

12. 401 004 d Elective IV: Airport and Bridge Engineering

On successful completion of this course, the learner will be able to,

01 Understand the fundamental of airport.

02 Understand and design the runway and taxiway and drainage systems.

03 Understand the BIM, AR and VR in airport planning and pavement design.

04 Plan the lighting and marking of airport and heliport.

05 Estimate various components of bridge and loads on bridges.

06 Study and design of bridge structures.

13. 401004 e Elective IV: Design of Prestressed Concrete Structures

On successful completion of this course, the learner will be able to,

01 Know the prestressed members.

02 Determining the stresses and various losses in prestressed concrete members.

03 Design the prestressed concrete structures

04 Design the prestressed concrete slab

05 Design the prestressed concrete flat slab

06 Analysis and design the prestressed continuous beams

14. 401004 f Elective IV: Formwork and Plumbing Engineering

On successful completion of this course, the learner will be able to,

01 Select appropriate material and type of formwork

02 Analyze the formwork for various loadings.

03 Illustrate the design aspects of formwork under various requirements.

04 Understand requirement of plumbing in a building.

05 Understand plumbing hydraulics and its components in plumbing system.

06 Illustrate the design aspects as per the requirement of Indian Standards.

15. 401 005: Project Stage I

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

01 Appraise the current Civil Engineering research/techniques/developments/interdisciplinary areas.

02 Review and organize literature survey utilizing technical resources, journals etc.

03 Evaluate and draw conclusions related to technical content studied.

04 Demonstrate the ability to perform critical writing by preparing a technical report.

05 Develop technical writing and presentation skills.

16. 401 009: Computer Programming in Civil Engineering

At the end of course the learner will be able to,

01 Understand basics of Python Programming

02 Write Python codes for variety of problems in civil Engineering.

17. 401010 Audit Course I a: Stress Management by Yoga

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

01 Develop understanding of Yoga and its impact on human body and mind.

02 Learn different Yogasans

03 Develop an understanding of meditation through pranayama

04 Learn different techniques of Pranayam.

18. 401010 Audit Course I b: Communication Etiquette in Workplaces

On successful completion of this course, the learner will be able to,

01 Develop an understanding of workplace codes, professionalism at workplace

02 Learn the workplace ethics

03 Develop an understanding of Business ethics, workplace privacy and ethics

04 Learn teamwork at workplace

SEM-II

19. **401011: Dams and Hydraulics Structures**

At the end of course the learner will be able to,

01 Understand types of dams and instrumentation working

02 Execute stability analysis of Gravity Dam

03 Understand types of spillways & Design of Ogee spillway

04 Illustrate the failures and analyze stability of earthen dam

05 Design Canals and understand the canal structures

06 Analysis of the Diversion headwork and Cross Drainage work

20. **401012: Quantity Surveying, Contracts and Tenders**

On successful completion of this course, the learner will be able to,

01 Understand concept of estimates and prepare approximate estimate for various for Civil Engineering works.

02 Describe tendering process, construction contracts, and aspects of Arbitration and prepare tenderdocuments**.**

03 Prepare detailed estimate of various items of work by different methods and calculate quantity ofsteel from Bar bending schedule.

04 Apply engineering knowledge to prepare estimate for roads, culverts, and water tank

05 Apply concepts of specification to draft brief specification, detailed specification and preparedetailed rate analysis report.

06 Evaluate depreciation and valuation of property on the basis of present condition, specifications
and market trend.

21. 401 013 a Elective V: Earthquake Engineering

On successful completion of this course, the learner will be able to,

01 Define the concepts of earthquakes, seismology and vibrations.

02 Model physical structures and develop equations of motion.

03 Solve the equations of motion for SDOF systems.

04 Solve the equations of motion for MDOF systems.

05 Perform static seismic analysis for buildings.

06 Perform dynamic seismic analysis for buildings.

22. 401013 b Elective V: Structural Design of Bridges

On successful completion of this course, the learner will be able to,

01 Identify loads on bridges and selection of type of bridge for the site condition as per Indian standards.

02 Design the reinforced concrete deck slab, culvert slab and T beam deck slab for highway bridges.

03 Analysis and design of reinforced concrete and post tension prestressed concrete girders.

04 Classify the types of rail bridges and design the plate girder steel bridges

05 Analyze and design the steel trussed bridges.

06 Study different types of bearing and thereby design the bearings for reinforced concrete highway bridges.

23. 401013 c Elective V: Irrigation and Drainage

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

01 Summarize types of irrigation methods.

02 Estimate evapotranspiration and crop-water requirement.

03 Understand component parts and their design considerations of lift irrigation system.

04 Design drip and sprinkler irrigation systems.

05 Understand basics of salt affected soils and estimate leaching requirement.

06 Design surface and subsurface drainage systems.

24. 401013 d Elective V: Design of Precast and Composite Structures

On successful completion of this course, the learner will be able to,

01 Achieve knowledge of design and development of problem solving skills.

02 Explore the concept of precast construction.

03 Learn the principles and design of precast structures

04 Understand the need, advantages and limitations of composite material.

05 Apply basic mechanical principles in analysis of composite structures like beams, columns, floors, shear connectors.

06 Understand and apply various provisions as per Indian standards in design of structural components using composite materials.

25. 401013 e Elective V: Hydropower Engineering

On successful completion of this course, the learner will be able to,

01 Understand the classification of power resources & trends in energy use patterns.

02 Identify the components of hydro power plant.

03 Analyze the load assessment for turbines.

04 Prepare the layout of power house based on the various structures need for it.

05 Design the turbines and surge tanks.

06 Understand the laws and regulatory aspects of hydroelectric power.

26. 401013 f Elective V: Structural Audit and Retrofitting of Structures

On successful completion of this course, the learner will be able to,

01 Identify causes of deterioration in RC and steel structures.

02 Explore entire process of structural audit.

03 Explore necessity and methods of structural health monitoring.

04 Explain method of retrofitting for RC, steel and historical structures.

05 Design retrofitting using FRP for RC column.

06 Design retrofitting using FRP for RC beams.

27. 401014 a Elective VI: TQM and MIS

On successful completion of this course, the learner will be able to,

01 Recognize quality and contribution of quality gurus for evaluation of best practices

02 Relate the functioning and application of TQM & Six Sigma in the domain of constructionsector

03 Recommend ISO 9001 principles in preparation of quality manual to construction business

04 Apply management control & certification systems for construction industry

05 Choose TQM process implementation and various quality awards for construction sector

06 Propose MIS for allied fields in construction sector

28. 401014 b Elective VI: Advanced Transportation Engineering

On successful completion of this course, the learner will be able to,

01 Analyze travel demand model and forecasting.

02 Evaluate relative importance of various modes and their capacities.

03 Design facilities required for non-motorized transportation and pedestrians.

04 Estimate basic characteristics of traffic stream and signal design.

05 Design flexible pavements.

06 Design rigid pavements and overlays.

29. 4010 14 c Elective VI: Geo-Synthetic Engineering

On successful completion of this course, the learner will be able to,

01 Explain types of Geo-synthetic material and its application in construction industry

02 Define physical and engineering properties of geo-synthetics material

03 Describe function of geo-synthetics material and its application in geo environment engineering

04 Analyse effect of geo-synthetics in design of flexible pavements

05 Design the reinforced soil retaining structures

06 Explain mechanism of soil reinforcement to improve bearing capacity of soil.

30. 401 014 d Elective VI: Structural Design of Foundations

On successful completion of this course, the learner will be able to,

01 Judge suitable type of shallow foundation based on the available soil category.

02 Decide suitable type of pile foundation for different soil stratum and evaluation of group capacity by formulation.

03 Design Raft foundations.

04 Design well and caissons Foundations.

05 Design different types of Machine foundations.

06 Design Retaining Structures.

31. 401014 e: Elective VI: Green Structures and Smart Cities

On successful completion of this course, the learner will be able to,

01 Students should be able to describe the importance of energy and minimization by altering the building materials.

02 Students should be able to understand the importance green construction and green

rating system

03 Students should be able to introduce the applications of energy conservation and efficiency practices in buildings.

04 Students should be able to understand phases and approval involved in smart city project.

05 Students should be able to assess the national and global experience of smart cities.

06 Students should be able to understand the importance of sustainable envelopment and current protocol of sustainable development goals.

32. 401014 f: Elective VI: Rural Water Supply Engineering

On successful completion of this course, the learner will be able to,

01 Understand issues related to rural water supply with respect to source, water related issues in rural areas.

02 Understand role of various government departments and importance of participatory approach.

03 Understand various types of rural water supply scheme and infrastructure requirements therein.

04 Understand interdisciplinary requirements in RWS including Software

05 Understand Automation requirements for a Water Supply Project

06 Understand Documentation and O and M issues related Water Supply Project including Leak Detection.

33. 401 015: Project Stage II

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

01 Appraise the current Civil Engineering research/techniques/developments/interdisciplinary areas.

02 Review and organize literature survey utilizing technical resources, journals etc.

03 Evaluate and draw conclusions related to technical content studied.

04 Demonstrate the ability to perform critical writing by preparing a technical report.

05 Develop technical writing and presentation skills.

34. 401019 Audit Course II a: Social Responsibility

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

01 Develop understanding of social responsibility

02 Learn the International framework for Social Responsibility

03 Know the drivers of social responsibility in India

04 Identify the key stakeholders of social responsibility

35.401019 Audit Course II b: Human Rights

On successful completion of this course, the learner will be able to,

01 Gather Knowledge about Human rights and Human rights Movement

02 Develop understanding of Human rights and Indian Constitution

03 Discuss Human Rights of the Different Sections and contemporary issues

04 Discuss International scenario towards human rights with reference to engineering Industry