

Nirma University
Institute of Technology
School of Engineering
Civil Engineering Department

B.Tech. Civil Engineering

Course Code: 2CL301

Course Name: Structural Mechanics-I

Course Outcomes:

At the end of the course, students will be able to –

1. determine internal forces in statically determinate structures
2. apply various methods to find displacements of statically determinate structures
3. estimate stresses for structural elements and structures like dam, chimney, wall etc.
4. evaluate buckling load of slender column
5. illustrate behaviour of structural elements through experimentation.

Course Code: 2CL302

Course Name: Surveying

Course Outcomes:

At the end of the course, students will be able to -

1. apply the knowledge of different survey methods for preparation of plan or map
2. calculate distance, angle, height, earthwork etc. from accurate recorded field data
3. acquire knowledge of modern survey systems such as total station, GIS, GPS, RS etc.
4. lay out any civil engineering structure on field.

Course Code: 2CL303

Course Name: Construction Materials

Course Outcomes:

After successful completion of the course, student will be able to

1. examine properties of materials related to civil engineering
2. apply measures to assess quality of concrete and its ingredient in the field and laboratory
3. evaluate and select appropriate construction materials for intended applications.

Course Code: 2CL304
Course Name: Civil Engineering Drawing and Building Planning
Course Outcomes:

At the end of the course, students will be able to –

1. interpret civil engineering drawings
2. apply principles of planning and building Bye-laws
3. plan a residential and public buildings and create perspective drawing
4. develop 2-dimensional and 3- dimensional drawing using CAD tools.

Course Code: 2CL401
Course Name: Structural Mechanics-II
Course Outcomes:

At the end of the course, students will be able to –

1. analyze statically indeterminate structures subjected to gravity and lateral loads using classical methods
2. evaluate displacements and internal forces of statically indeterminate structures using matrix methods and approximate methods
3. construct influence line diagrams for beams and trusses
4. illustrate behaviour of structural elements through experimentation

Course Code: 2CL402
Course Name: Fluid Mechanics
Course Outcomes:

At the end of the course, students will be able to –

1. comprehend properties of fluids for civil engineering applications
2. apply kinematics and dynamics of flow for solving engineering problems
3. analyse fluid flow through close conduits and open channels.

Course Code: 2CL403
Course Name: Construction Technology
Course Outcomes:

At the end of the course, students will be able to –

1. recognize various building components, construction activities and equipment
2. identify and select appropriate openings, roofs, flooring and types of finishes or buildings
3. recommend appropriate mode of vertical movements and building services.

Course Code: CL404
Course Name: Geotechnical Engineering
Course Outcomes:

At the end of the course, students will be able to –

1. appraise application of geology in civil engineering problems
2. classify soils and derive physical properties of soil
3. evaluate engineering properties of soil such as permeability, compaction and shear strength.

Course Code: 2CL405
Course Name: Transportation Engineering
Course Outcomes:

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

1. comprehend basic requirements of highway, railway, harbour and airport
2. design the geometric elements of highways
3. characterize pavement materials and design pavements
4. perform traffic studies and implement traffic regulation and control measures.

Course Code: 2CL501
Course Name: Design of Concrete Structures
Course Outcomes:

At the end of the course, students will be able to –

1. explain the structural planning and gravity load transfer mechanism
2. design various types of beam for reinforced concrete building
3. analyze and design various types of reinforced concrete slab
4. design columns and footings for reinforced concrete building.

Course Code: 2CL502
Course Name: Environmental Engineering
Course Outcomes:

At the end of the course, students will be able to –

1. predict water demand for design of water distribution network
2. assess quality of water and design water treatment system
3. evaluate characteristics of wastewater and design sewerage system
4. illustrate the concepts of solid waste management, air pollution and noise pollution.

Course Code: 2CL503

Course Name: Foundation Engineering

Course Outcomes:

At the end of the course, students will be able to –

1. evaluate the engineering properties of soils
2. analyze and design shallow foundation
3. analyze and design deep foundation
4. assess stability of retaining structure & slopes and select appropriate ground improvement technique.

Course Code: 2CL504

Course Name: Computational Tools and Techniques

Course Outcomes:

At the end of the course, students will be able to –

1. apply numerical methods for Civil Engineering problem solution
2. make use of spreadsheet for Civil Engineering applications
3. develop computer program for Civil Engineering problems and organise solution output.

Course Code: 2CL601

Course Name: Water Resources and Irrigation Engineering

Course Outcomes:

At the end of the course, students will be able to –

1. illustrate hydrological cycle and construct hydrograph
2. assess groundwater characteristics and demonstrate functionality of ground water hydraulics
3. estimate water requirement for crops and choose appropriate irrigation methods
4. analyze and design gravity and earth dam.

Course Code: 2CL602

Course Title: Construction Project Management

Course Outcomes:

After successful completion of the course, student will be able to –

1. implement modern techniques for construction project
2. develop and analyze project network
3. organize site and resources for construction project
4. appraise quality and safety management practices

5. propose monitoring and controlling techniques for construction project.

Course Code: 2CL603

Course Name: Construction Workshop

Course Outcomes:

At the end of the course, students will be able to –

1. experiment with different materials and tools for building construction
2. plan and execute construction activities in a team
3. relate the acquired theoretical knowledge with field practices

Course Code: 2CLDE51

Course Name: Advanced Concrete Technology

Course Outcomes:

At the end of the course, students will be able to –

1. recommend use of supplementary cementitious materials.
2. appraise applications of construction chemicals
3. choose appropriate concrete types and concreting techniques for practical applications.

Course Code: 2CLDE01

Course Name: Advanced Solid Mechanics

Course Outcomes:

At the end of the course, students will be able to –

1. apply theory of elasticity for stress and strain analysis
2. determine torsional stresses in prismatic section
3. apply theory of failure for solid mechanics problems

Course Code: 2CLDE52

Course Name: Advanced Structural Mechanics

Course Outcomes:

At the end of the course, students will be able to –

1. analyze skeletal structures using stiffness member approach
2. apply finite element method for bar and beam elements
3. develop spread sheets and computer programs for skeletal structures.

Course Code: 2CLDE53

Course Name: Advanced Design of Concrete Structures

Course Outcomes:

At the end of the course, students will be able to –

1. assess serviceability criteria and earthquake resistance design of RC structures

2. design structural elements such as slender column, flat slab and shear wall
3. analyze and design retaining wall and water retaining structures.

Course Code: 2CLDE02

Course Name: Prestressed Concrete

Course Outcomes:

At the end of the course, students will be able to –

1. evaluate stresses in prestressed concrete structural elements
2. assess losses and deflection in prestressed concrete structural elements
3. design pre-tensioned and post-tensioned beams.

Course Code: 2CLDE54

Course Name: Maintenance and Rehabilitation of Structures

Course Outcomes:

At the end of the course, students will be able to –

1. examine critical aspects related to maintenance of different structures
2. demonstrate factors affecting durability and compatibility aspects of concrete
3. illustrate different techniques and apply different repair materials and techniques for strengthening of structures
4. discover different construction failures through investigation

Course Code: 2CLDE03

Course Name: Earthquake Resistant Design of Structures

Course Outcomes:

At the end of the course, students will be able to –

1. illustrate phenomenon, causes and effects of earthquake
2. apply concepts of structural dynamics to earthquake problems
3. design earthquake resistant Reinforced Concrete (RC) structures using codal provisions.

Course Code: 2CLDE04

Course Name: Port and Harbour Engineering

Course Outcomes:

At the end of the course, students will be able to –

1. interpret requirements of harbour and port planning
2. plan and design various components of harbour and port
3. select appropriate aids and facilities for operation of port
4. justify dredging and protection requirement of harbour.

Course Code: 2CLDE05

Course Title: Airport Engineering

Course Outcomes:

At the end of the course, students will be able to -

1. interpret basic requirements for airport planning
2. plan and design various components of airport
3. select appropriate aids for operation of airport.

Course Code: 2CLDE06

Course Name: Traffic Engineering and Road Safety

Course Outcomes:

At the end of the course, students will be able to –

1. outline traffic characteristics and plan traffic studies
2. develop engineering solutions to ease traffic congestion and improve road safety
3. assess traffic stream characteristics, level of service and capacity of roadways and intersections.

Course Code: 2CLDE07

Course Title: Pavement Engineering

Course Outcomes (CO)

At the end of the course, students will be able to -

1. analyze the factors affecting design and performance of pavements
2. design flexible and rigid pavement systems
3. elaborate construction of flexible and rigid pavements with quality control
4. evaluate pavement distress and evolve maintenance management plan.

Course Code: 2CLDE08

Course Title: Infrastructure Management

Course Outcomes:

After successful completion of the course, student will be able to –

1. interpret concept of infrastructure and infrastructure risk management and maintenance strategies
2. evaluate urban and rural infrastructure based on need, requirement and policy
3. recommend a public private partnership model for infrastructure project.

Course Code: 2CLDE09

Course Name: Urban Transportation Planning

Course Outcomes:

At the end of the course, students will be able to –

1. interpret various concepts of urban transportation planning
2. identify and apply suitable techniques for urban transportation modelling

3. utilize transport policies and recommend suitable urban transportation system plan

Course Code: 2CLDE10

Course Name: Urban Planning and Management

Course Outcomes:

At the end of the course, students will be able to –

1. infer theory and process of urban and regional planning
2. interpret and implement urban policy and process of urban governance
3. select and apply appropriate techniques for urban development and management
4. develop urban project management plan

Course Code: 2CLDE11

Course Title: Advanced Construction Technologies

Course Outcomes:

At the end of the course, students will be able to -

1. appraise formwork techniques for construction
2. make use of precast construction techniques
3. apply specialized technique for Civil construction
4. choose suitable construction techniques for bridge, tunnel and offshore structures.

Course Code: 2CLDE12

Course Title: Sustainable Building Technologies

Course Outcomes:

At the end of the course, students will be able to -

1. appraise concepts of sustainable development and rating systems
2. recommend building materials and technologies for sustainable construction.
3. formulate strategies for resource conservation and waste management.

Course Code: 2CLDE13

Course Name: Building Systems, Safety and Services

Course Outcomes:

At the end of the course, students will be able to –

1. design and implement water and drainage system
2. apply electrical and lighting system in building
3. select appropriate systems for vertical transportation and HVAC
4. identify appropriate safety and security systems in building.

Course Code: 2CLDE55

Course Name: Geomatics

Course Outcomes:

At the end of the course, students will be able to –

1. apply remote sensing techniques for Civil Engineering applications
2. demonstrate applications of Geographical Information System (GIS) in Civil Engineering
3. illustrate concept of geodesy and global navigation satellite system.

Course Code: 2CLDE14

Course Title: Advances in Construction Project Management

Course Outcomes:

At the end of the course, student will be able to -

1. apply principles of accounting and finance management for construction project
2. analyze ladder and precedence network for construction project management
3. identify risk and apply insurance policies for construction projects
4. appraise modern project management and information system.

Course Code: 2CLDE15

Course Name: Advanced Soil Mechanics

Course Outcomes:

At the end of the course, students will be able to –

1. infer flow through soils
2. analyze the stresses in soil under various conditions
3. assess shear strength of soils.

Course Code: 2CLDE16

Course Name: Applied and Engineering Geology

Course Outcomes:

At the end of the course, students will be able to –

1. appraise the importance of geological investigation for civil engineering project
2. classify rocks and assess their engineering properties
3. summarize structural features of rock and fundamentals of seismology

Course Code: 2CLDE56

Course Name: Advanced Foundation Design

Course Outcomes:

At the end of the course, students will be able to –

1. evaluate in-situ soil properties for analysis and design of foundations
2. recommend appropriate foundation on problematic soil

3. analyze and design of retaining structures.

Course Code: 2CLDE17

Course Name: Geo-environmental Engineering

Course Outcomes:

At the end of the course, students will be able to –

1. identify subsurface contamination, its sources and control measures
2. organize components of landfill sites
3. recommend technological solution for geo-environmental issues.

Course Code: 2CLDE57

Course Name: Ground Improvement Techniques

Course Outcomes:

At the end of the course, students will be able to –

1. make use of soil stabilization technique
2. appraise the application of geosynthetics in practice
3. illustrate drainage techniques.

Course Code: 2CLDE18

Course Name: Air and Noise Pollution

Course Outcomes:

At the end of the course, students will be able to -

1. analyze and interpret air pollution data
2. appraise effects and controlling measures of air pollution
3. identify effects of noise pollution and select appropriate control method.

Course Code: 2CLDE19

Course Name: Solid Waste Management

Course Outcomes:

At the end of the course, students will be able to -

1. classify waste generation and apply suitable processing & disposal methods for solid waste
2. choose appropriate methods of handling and treatment for hazardous waste
3. explain the impact of e-waste management and plastic waste management
4. appraise legal requirements of waste management.

Course Code: 2CLDE58

Course Name: Industrial Wastewater Treatment and Management

Course Outcomes:

At the end of the course, students will be able to -

1. identify characteristics of industrial wastewater and apply volume and strength reduction techniques.
2. design industrial wastewater treatment units and apply disposal standards.
3. appraise the concept of common effluent treatment plant.

Course Code: 2CLDE20

Course Name: Environmental Management System

Course Outcomes:

At the end of the course, students will be able to –

1. illustrate environment management system and demonstrate role of policies and standards
2. take part in environment impact & life cycle assessment.
3. plan and conduct environment audit.

Course Code: 2CLDE59

Course Name: Advanced Fluid Mechanics

Course Outcomes:

At the end of the course, students will be able to -

1. apply the knowledge of model analysis and boundary layer theories to solve fluid flow problems
2. solve problems of non-uniform, gradually and rapidly varied flows in steady state conditions
3. estimate flow through pipes for analysis of pipe networks.

Course Code: 2CLDE21

Course Name: Hydraulic Structures

Course Outcomes:

At the end of the course, students will be able to -

1. analyze and design embankment dam
2. analyze and design gravity dam
3. design components of dam outlet and drop structures

Course Code: 2CLDE22

Course Name: Irrigation and Water Management

Course Outcomes:

At the end of the course, students will be able to –

1. appraise the requirement of water management and soil-water relationship for irrigation
2. estimate crop water requirement for irrigation

3. design surface, drip and sprinkler irrigation methods.

Course Code: UEIT009

Course Name: Environmental Conservation for Sustainable Development

Course Outcomes:

At the end of the course, students will be able to –

1. identify and analyse environmental issues related to developments and address suitable mitigation measures
2. comprehend and formulate appropriate environmental pollution control methodology
3. identify and assess environmental hazards, consequences and safety provisions
4. select and evolve appropriate environmental monitoring and management strategies.

Course Code: 2CLOE01

Course Title: Intelligent Transportation System

Course Outcomes:

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

1. outline need of Intelligent Transportation System (ITS)
2. illustrate role of communication systems in ITS
3. identify functional areas and services of ITS
4. apply ITS for automated highway systems.

Course Code: 2CLOE02

Course Title: Remote Sensing, GIS and GPS

Course Outcomes:

At the end of the course, students will be able to -

1. apply principles of Remote Sensing in Engineering
2. demonstrate applications of Geographical information system (GIS) in Engineering domains
3. appraise the need of geodesy and projection system in map making
4. illustrate applications of Global Positioning System (GPS) in Engineering domains.

Course Code: 2CLOE03

Course Name: Composite Materials

Course Outcomes:

At the end of the course, students will be able to –

1. explain characteristics and applications of composite materials
2. illustrate manufacturing process for development of composite materials
3. assess the mechanical behaviour of composite materials
4. apply failure theories for strength assessment of the laminate.

Course Code: 2CLOE04

Course Name: Finite Element Method

Course Outcomes:

At the end of the course, students will be able to –

1. demonstrate finite element formulation
2. analyze one dimensional engineering problems
3. solve two dimensional problems of engineering using finite element
4. utilize computer program for solving engineering problems.

Course Code: 2CLOE26

Course Name: Disaster Management

Course Outcomes:

At the end of the course, students will be able to –

1. assess risk of a disaster and associated damages
2. develop a disaster management plan
3. appraise role of various stakeholders in disaster management
4. perceive disaster management policies.

Course Code: 2CLOE27

Course Title: Environmental Pollution and Legislation

Course Outcomes:

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

1. assess environmental issues using performance indices
2. recommend remedies of environmental pollution
3. identify the risk due to toxic substances and pollutants
4. interpret Indian legislations for environmental pollution
5. outline international environmental laws.

Course Code: 2CLOE28

Course Name: Road Safety and Management

Course Outcomes:

At the end of the course, students will be able to –

1. appraise the design parameters of road geometrics
2. analyse traffic characteristics of roadway
3. evaluate the causes of road accidents and take part in road safety audit
4. infer traffic regulations and apply traffic management systems.

Course Code: 2CLOE29

Course Title: Project Management

Course Outcomes:

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

1. choose the most appropriate project alternative
2. plan, schedule and control the project
3. appraise accounts and finance of the project
4. apply management principles to optimize the resources and implement quality and safety

Course Code: 2CL701

Course Name: Design of Steel Structures

Course Outcomes:

At the end of the course, students will be able to –

1. appraise design philosophies for steel structures
2. analyze and design tension members and connections
3. analyze and design various types of compression member
4. design flexural members for steel structure
5. analyze, design and detail industrial structures.

Course Code: 2CL702

Course Name: Professional Practice

Course Outcomes:

At the end of the course, student will be able to –

1. Calculate the quantity of residential building and compute the probable cost
2. Estimate the quantity of RCC elements for various structures
3. Assess the probable cost of infrastructure projects
4. Appraise the need of specification, tendering, contract and valuation for construction projects

Course Code: 2CL703

Course Name: Minor Project

Course Outcomes:

At the end of the course, students will be able to –

1. make use of acquired knowledge for the problem identification and definition,
2. analyze the technical aspects of the project with a comprehensive and systematic approach,
3. propose and select the appropriate solution,
4. appraise the importance of an individual / team for effective execution,

5. compile and conclude the project with effective communication amongst peers, mentors and society.

Course Name: Summer Internship

Course Outcomes:

At the end of the course, students will be able to –

1. perceive a better understanding of the engineering workplace,
2. adapt competencies necessary for professional career,
3. value interpersonal and human relationship skills,
4. build the foundation for industrial internship / major project.

Course Code: 2CL801

Course Name: Major Project

Course Outcomes:

At the end of the course, students will be able to –

1. make use of acquired knowledge for the problem identification and definition related to industry / research / societal need,
2. analyze the technical aspects of the project with a comprehensive and systematic approach,
3. select the appropriate modern tool(s) and technique(s) for problem solving,
4. propose and select the appropriate and cost-effective solution,
5. appraise the importance of an individual / team for effective execution,
6. value the health, environment, safety and ethical practices during the project,
7. perceive the possibility of scalability and scope of intellectual property rights,
8. compile and conclude the project with effective communication amongst peers, mentors and society.
9. Develop life-long learning skills for productive career

Course Code: 2CL801

Course Name: Industrial Internship

Course Outcomes:

At the end of the course, students will be able to –

1. support the theoretical learning with practice and integrate knowledge for engineering applications.
2. adapt to real time industry exposure and experience
3. develop work habits, interpersonal skills and attitudes necessary for professional success
4. evaluate the interests and abilities in the field of study,
5. appraise the importance of an individual and multidisciplinary team for effective execution,

6. build the career alternatives prior to graduation,
7. value the health, environment, safety and ethical practices during the internship,
8. compile and conclude the learning during internship with effective communication amongst peers, mentors and society,
9. develop lifelong learning skills for productive career /entrepreneurship.