

POSTGRADUATE STUDIES

List of Postgraduate Courses

Structural Engineering

| Course Code | Course Name | Hrs/Week | | | Marks | | | Exam Hrs |
|-------------|---|----------|-----|-------|------------|-----------|-------|----------|
| | | Lect | Ex. | Total | Final Exam | Year Work | Total | |
| CES 501 | Numerical Analysis in Structural Engineering | 2 | 1 | 3 | 70 | 30 | 100 | 3 |
| CES 502 | Advanced Structural Analysis | 2 | 1 | 3 | 60 | 40 | 100 | 3 |
| CES 503 | Dynamics of Structures | 2 | 1 | 3 | 60 | 40 | 100 | 3 |
| CES 504 | Plastic Analysis of Structures | 2 | 1 | 3 | 60 | 40 | 100 | 3 |
| CES 505 | Stability of Steel Structures | 2 | 1 | 3 | 60 | 40 | 100 | 3 |
| CES 506 | Properties and Testing of Materials | 2 | 1 | 3 | 60 | 40 | 100 | 3 |
| CES 507 | Statistics in Structural Engineering | 2 | 1 | 3 | 60 | 40 | 100 | 3 |
| CES 508 | Methods of Repair and Strengthening | 2 | 1 | 3 | 60 | 40 | 100 | 3 |
| CES 509 | Quality Control and Quality Assurance | 2 | 1 | 3 | 70 | 30 | 100 | 3 |
| CES 510 | Modern Concrete Bridges | 2 | 1 | 3 | 60 | 40 | 100 | 3 |
| CES 511 | Pre-Stressed Concrete Structures | 2 | 1 | 3 | 60 | 40 | 100 | 3 |
| CES 512 | Site Investigation and Soil Testing | 2 | 1 | 3 | 60 | 40 | 100 | 2 |
| CES 513 | Earthwork Engineering | 2 | 1 | 3 | 60 | 40 | 100 | 3 |
| CES 514 | Fabrication, Erection and Maintenance of Steel Structures | 2 | 1 | 3 | 60 | 40 | 100 | 3 |
| CES 515 | Behavior of Steel Structures | 2 | 1 | 3 | 60 | 40 | 100 | 3 |
| CES 516 | Bids and Contracts | 2 | 1 | 3 | 70 | 30 | 100 | 3 |
| CES 517 | General management in Construction Projects | 2 | 1 | 3 | 70 | 30 | 100 | 3 |
| CES 518 | Projects Planning and Control (1) | 2 | 1 | 3 | 70 | 30 | 100 | 3 |
| CES 519 | Projects Planning and Control (2) | 2 | 1 | 3 | 70 | 30 | 100 | 3 |
| CES 520 | Construction Equipment | 2 | 1 | 3 | 70 | 30 | 100 | 3 |
| CES 521 | Construction Economics | 2 | 1 | 3 | 70 | 30 | 100 | 3 |
| CES 599 | Project | 0 | 3 | 3 | Oral | 0 | 100 | 0 |
| CES 601 | Wind and Earthquakes Engineering | 2 | 1 | 3 | 60 | 40 | 100 | 3 |
| CES 602 | Finite Element Analysis | 2 | 1 | 3 | 60 | 40 | 100 | 3 |
| CES 603 | Advanced Testing of Products and Structures | 2 | 1 | 3 | 60 | 40 | 100 | 3 |
| CES 604 | Soil Dynamics | 2 | 1 | 3 | 60 | 40 | 100 | 3 |
| CES 605 | Resources Management | 2 | 1 | 3 | 60 | 40 | 100 | 3 |
| CES 606 | Productivity in The Construction | 2 | 1 | 3 | 60 | 40 | 100 | 3 |

| Course Code | Course Name | Hrs/Week | | | Marks | | | Exam Hrs |
|-------------|---|----------|-----|-------|------------|-----------|-------|----------|
| | | Lect | Ex. | Total | Final Exam | Year Work | Total | |
| CES 701 | Finite Element Method (2) | 2 | 1 | 3 | 70 | 30 | 100 | 3 |
| CES 702 | Boundary Element Method (2) | 2 | 1 | 3 | 60 | 40 | 100 | 3 |
| CES 703 | Theory of Plasticity | 2 | 1 | 3 | 60 | 40 | 100 | 3 |
| CES 704 | Soil and Foundation Dynamics | 2 | 1 | 3 | 60 | 40 | 100 | 3 |
| CES 705 | Theory of Shells | 2 | 1 | 3 | 60 | 40 | 100 | 3 |
| CES 706 | Computational Fracture Mechanics | 2 | 1 | 3 | 60 | 40 | 100 | 3 |
| CES 707 | Expert Systems in Structural Engineering | 2 | 1 | 3 | 60 | 40 | 100 | 3 |
| CES 708 | Reliability of Structures | 2 | 1 | 3 | 60 | 40 | 100 | 3 |
| CES 709 | Seismic Design of Civil Structures | 2 | 1 | 3 | 70 | 30 | 100 | 3 |
| CES 710 | Advanced Numerical Analysis | 2 | 1 | 3 | 60 | 40 | 100 | 3 |
| CES 711 | Nonlinear Analysis of Reinforced Concrete | 2 | 1 | 3 | 60 | 40 | 100 | 3 |
| CES 712 | Composite Materials (2) | 2 | 1 | 3 | 60 | 40 | 100 | 2 |
| CES 713 | Special Steel Structures | 2 | 1 | 3 | 60 | 40 | 100 | 3 |
| CES 714 | Seismic Behavior of Steel Structures (2) | 2 | 1 | 3 | 60 | 40 | 100 | 3 |
| CES 715 | Steel Bridges (3) | 2 | 1 | 3 | 60 | 40 | 100 | 3 |
| CES 716 | Optimization of Steel Structures | 2 | 1 | 3 | 70 | 30 | 100 | 3 |

Irrigation & Hydraulics

| Course Code | Course Name | Hrs/Week | | | Marks | | | Exam Hrs |
|-------------|--|----------|-----|-------|------------|-----------|-------|----------|
| | | Lect | Ex. | Total | Final Exam | Year Work | Total | |
| CEI 501 | Hydrodynamics | 2 | 1 | 3 | 60 | 40 | 100 | 3 |
| CEI 502 | Hydraulic Engineering | 2 | 1 | 3 | 60 | 40 | 100 | 3 |
| CEI 503 | Sediment Transport (1) | 2 | 1 | 3 | 60 | 40 | 100 | 3 |
| CEI 504 | Engineering Hydraulics Laboratory (1) | 2 | 1 | 3 | 60 | 40 | 100 | 3 |
| CEI 505 | Irrigation and Drainage Engineering | 2 | 1 | 3 | 60 | 40 | 100 | 3 |
| CEI 506 | Hydraulic Structures (1) | 2 | 1 | 3 | 60 | 40 | 100 | 3 |
| CEI 507 | Basics of Coastal and Harbor Engineering | 2 | 1 | 3 | 60 | 40 | 100 | 3 |
| CEI 508 | Ocean Wave Mechanics | 2 | 1 | 3 | 60 | 40 | 100 | 3 |
| CEI 509 | Inland Navigation | 2 | 1 | 3 | 60 | 40 | 100 | 3 |
| CEI 510 | Environmental Impact Assessment of Irrigation Projects | 2 | 1 | 3 | 70 | 30 | 100 | 3 |
| CEI 511 | Coastal Environment Engineering | 2 | 1 | 3 | 60 | 40 | 100 | 3 |
| CEI 512 | Topics in Harbor and Coastal Engineering | 2 | 1 | 3 | 70 | 30 | 100 | 3 |
| CEI 599 | Project | 0 | 3 | 3 | Oral | 0 | 100 | |
| CEI 601 | Advanced Fluid Mechanics | 2 | 1 | 3 | 60 | 40 | 100 | 3 |
| CEI 602 | Advanced Hydraulics | 2 | 1 | 3 | 60 | 40 | 100 | 3 |
| CEI 603 | Hydraulic Modeling (2) | 2 | 1 | 3 | 60 | 40 | 100 | 3 |
| CEI 604 | Hydrologic Systems Analysis | 2 | 1 | 3 | 60 | 40 | 100 | 3 |
| CEI 605 | Groundwater Hydrology (2) | 2 | 1 | 3 | 60 | 40 | 100 | 3 |
| CEI 606 | Water Resources Management | 2 | 1 | 3 | 60 | 40 | 100 | 3 |
| CEI 607 | Pump Station Engineering (2) | 2 | 1 | 3 | 60 | 40 | 100 | 3 |
| CEI 608 | Marine Offshore Structures | 2 | 1 | 3 | 60 | 40 | 100 | 3 |
| CEI 609 | Stream Pollution Control | 2 | 1 | 3 | 60 | 40 | 100 | 3 |
| CEI 610 | Engineering Hydraulics Laboratory (2) | 2 | 1 | 3 | 60 | 40 | 100 | 3 |

Public Works

| Course Code | Course Name | Hrs/Week | | | Marks | | | Exam Hrs |
|-------------|---|----------|----|-------|------------|-----------|-------|----------|
| | | Lect | Ex | Total | Final Exam | Year Work | Total | |
| CEP 501 | Sanitary Chemistry | 2 | 1 | 3 | 60 | 40 | 100 | 3 |
| CEP 502 | Bacteriology of Water and Wastewater | 2 | 1 | 3 | 60 | 40 | 100 | 3 |
| CEP 503 | Environmental Engineering and Pollution Control (1) | 2 | 1 | 3 | 60 | 40 | 100 | 3 |
| CEP 601 | Hydraulics of Networks & Plants | 2 | 1 | 3 | 60 | 40 | 100 | 3 |
| CEP 602 | Chemistry of Water | 2 | 1 | 3 | 60 | 40 | 100 | 3 |
| CEP 603 | Microbiology of Water | 2 | 1 | 3 | 60 | 40 | 100 | 3 |
| CEP 604 | Advanced Water Treatment | 2 | 1 | 3 | 60 | 40 | 100 | 3 |
| CEP 605 | Advanced Domestic Wastewater Treatment | 2 | 1 | 3 | 60 | 40 | 100 | 3 |
| CEP 606 | Advanced Sludge Treatment | 2 | 1 | 3 | 60 | 40 | 100 | 3 |
| CEP 607 | Water Treatment Modeling | 2 | 1 | 3 | 60 | 40 | 100 | 3 |
| CEP 608 | Waste water Treatment Modeling | 2 | 1 | 3 | 60 | 40 | 100 | 3 |
| CEP 609 | Water Supply Systems Modeling | 2 | 1 | 3 | 60 | 40 | 100 | 3 |
| CEP 610 | Sewerage Systems Modeling | 2 | 1 | 3 | 60 | 40 | 100 | 3 |
| CEP 611 | Networks Operation & Maintenance Programs | 2 | 1 | 3 | 60 | 40 | 100 | 3 |
| CEP 612 | Sea Water Desalination | 2 | 1 | 3 | 60 | 40 | 100 | 3 |
| CEP 613 | Reuse of Solid Wastes | 2 | 1 | 3 | 60 | 40 | 100 | 3 |
| CEP 614 | Sludge Disposal & Reuse | 2 | 1 | 3 | 60 | 40 | 100 | 3 |
| CEP 615 | Utilities Networks Planning & Its Economy | 2 | 1 | 3 | 60 | 40 | 100 | 3 |

Structural Engineering

CES 501 Numerical Analysis in Structural Engineering

Approximate and Variation Methods Suitable for The Analysis of Various Types of Structures Finite Difference Method, Finite Element Method, Matrices, Matrix Algebra, Direct and Indirect Solutions of Simultaneous Equations, Eigen value Problem, Determination of Eigen values and Eigenvectors, Application of These Methods to Practical Problems of Special Interest, Computer Implementation.

CES 502 Advanced Structural Analysis

Matrix Methods of Structural Analysis, Substructures, Transfer Matrices, Computation Methods, Finite Differences Applied to Continua, Energy Theorems, Variation Methods.

CES 503 Dynamics of Structures

Types of Dynamic Loads, Types of Structural Systems, Free and Forced Vibrations, Solution of Eigen value Problem, Modal Superposition Method, Deterministic Time Domain Integration Method, Stochastic Method, Duhamel Integral, Response Spectrum, Applications.

CES 504 Plastic Analysis of Structures

Basic Concepts of Plastic Analysis, Theorems, Static Method, Method of Virtual Work Applications.

CES 505 Stability of Structures

Different Methods of Analysis, Imperfect Columns, Inelastic Buckling, Buckling By Approximate Methods, Beam Columns, Modified Slope Deflection Equations, Torsional Buckling of Columns, Torsional Flexural Buckling, Buckling of Plates.

CES 506 Properties and Testing of Materials

Fundamental Properties of Materials, Types of Materials, Principals of Testing, Different Types of Testing, Code of Practice and Specifications.

CES 507 Statistics in Structural Engineering

Collection and Analysis of Data, Graphical Description of Data, Probability Models, Continuous Probability Models, Simple and Multiple Regression, Statistical Quality Control, Analysis of Variance, Tests of Statistical Hypothesis, Auto-Correlation, Cross Correlation, and Power Spectra Functions.

CES 508 Methods of Repair and Strengthening

Causes of Defects, Evaluation of Structures, Materials for Repair and Strengthening, Repair Methods, Strengthening Methods.

CES 509 Quality Control and Quality Assurance

Concrete Mixture Design Methods, Technical Inspection, Quality Control Steps, Components of Quality Assurance, Conceptual Basis for Quality Assurance Schemes.

CES 510 Modern Concrete Bridges

Introduction and Specifications, Types of Pre-Stressed Concrete Bridges, Box Girder Bridges, Skew Bridges, Curved Bridges, Method of Constructions, Suspension Bridges, Composite Bridges.

CES 511 Pre-Stressed Concrete Structures

Pre-Stress Losses, Fully and Partially Pre-Stressed Concrete Structures, Ultimate Strength, Serviceability, Fiber-Reinforced Applications, Behavior of Beams Pre-Stressed By Fiber-Reinforced Plastic Tendons, Limit State Method.

CES 512 Site Investigation and Soil Testing

Various Site Investigation Techniques, In-Site and Laboratory Tests, Field Measurements, Measuring The Aggression of Soil and Ground Water.

CES 513 Earthwork Engineering

Filling Using Rock and Soil Materials, Temporary Retaining Structures of Deep Excavation, Earthwork Equipment, Advanced Methods for Stability Analysis and Cuts, Design of Earth and Rock Dikes and Dams.

CES 514 Fabrication, Erection and Maintenance of Steel Structures

Fabrication of Steel Structures, Automatic Production Lines, Mass Production, Tolerances, Different Methods of Erection, Methods of Strengthening, Inspection and Maintenance Requirements of Steel Structures.

CES 515 Behavior of Steel Structures

Critical Evaluation of The Actual Behavior of Metals Connections Members and Structures Significance of This Behavior in Terms of Design, Development of Design Specifications.

CES 516 Bids and Contracts

Preparation of Bids, Tendering Documents, Contract Types and Conditions, Sub Contracting, Insurance and Quality Assurance, Claims, Arbitration.

CES 517 General Management in Construction Projects (1)

The Life Cycle of Construction Projects, Organizations Contracts Concepts, Relationships and Responsibilities of All Participants in The Construction Projects, Reconstruction Investigations, Construction Phase Responsibilities, Applications.

CES 518 Projects Planning and Control (1)

Construction Planning and Organizations, Planning Techniques, Check List, S-Curve, Bar Chart, Matrix Schedule, Line of Balance, Network, CPM and PERT, Resource Allocation and Leveling, Linear Programming and Applications.

CES 519 Projects Planning and Control (2)

Simplex Techniques, Transportation Problems, Monte-Carlo Simulation and Applications, Dynamic Programming, Queuing Theory and Applications, Stock Control.

CES 520 Construction Equipment

Major Mechanical Operations, Earth Moving Equipment, Hoisting Equipment, Conveying, Pumping Batching Plant, Pile Driving. Planning and Selection of Equipment, Production Estimates, Sizing, Matching, Economics of Construction Equipment. Preventive Maintenance and Repairs, Systems Approach to Planning and Applications.

CES 521 Construction Economics

Time Value of Money, Economic Comparisons Between Projects, Investment Analysis, Methods of Comparisons Between Projects Based on Capital and Time Needed, Feasibility Studies, Sources of Capital, Commitment Costing, Financial Ratio, Job Evaluation, Cost Benefit Analysis, Incentives.

CES 599 Project

Independent Work Leading to Writing an Extensive Article, Preparing a Theoretical Study or Experimental Work With Complete Analysis in Topic Relevant to The Diploma Field of Study.

CES 601 Wind and Earthquakes Engineering

Nature and Characteristics of Wind and Earthquakes, Main Assumptions, Governing Equations for Analysis, Quasi Static Method, Stochastic Method, Step By Step Integration Method, Code Requirements, Applications.

CES 602 Finite Element Analysis

Development of Displacement-Based Element for Linear Elastic Stress Analysis, Variation and Other Methods for Element Formulation, Plate Bending and Shell Element, Finite Element Programming, Nonlinear Analysis, Nonlinear Finite Element Formulation, Large Deformations and Material Non-Linearity, Visco-Elastic and Visco-Plastic Formulation, Heat Conduction, Fluid Flow.

CES 603 Advanced Testing of Products and Structures

Testing of Pipes, Testing of Cables, Testing of Springs, Testing of Ropes, Testing of Joints and Connections, Testing of Structures, Testing of Repaired and Strengthened Elements.

CES 604 Soil Dynamics

Fundamentals of Vibrations, Fundamentals of Soil Dynamics, Dynamic Testing of Soil, Dynamic Soil Properties, Foundations Subjected to Dynamic Forces, and Earthquakes and Geotechnical Engineering.

CES 605 Resources Management

Material Management, Human Resources Management, Site Management, Information System, Team Organization, Recruiting and Training, Incentives, Labor Relation, Costs, Reporting.

CES 606 Productivity in Construction

Factors Affecting Productivity, Productivity Engineering and Management, Productivity Measurement, Work Study, Method Study, Total Productivity, Productivity Improvement Techniques.

CES 699 Master Thesis

CES 701 Finite Element Method (2)

Thick Reissner–Mindlin plates; Reduced/selective integration; Hybrid–mixed formulation of structural elements: beams, curved beams, and plate bending; Formulation of general shell elements; Finite element nonlinear analysis: formulation of continuum-mechanics, incremental equations of motion, deformation gradient, strain and stress tensors, continuum mechanics incremental total and updated Lagrangian formulation, materially nonlinear analysis; Displacement–based isoparametric continuum finite elements: linearization of the principle of virtual work, general matrix equation, truss and cable elements, two-dimensional elements, three dimensional solid elements, structural elements such as beams, plates, and shells; Use of constitutive relations: elastic material behavior, inelastic material behavior, large strains for elasto- plastic materials; Solution of equilibrium equation in dynamic analysis: direct integration method such as central difference method, Houbolt method, Wilson method, and Newmark method, Mode superposition method.

CES 702 Boundary Element Method (2)

Axisymmetric elastostatic problems; Inelastic behavior of materials; Governing equations; Boundary integral formulation; Internal stresses; Initial strain formulation; Initial stress formulation; Internal cells; Elastoplastic relations; Coupling with finite elements.

CES 703 Theory of Plasticity

Stress–strain relations for elastic and perfectly plastic solids; Yield criteria; Work hardening; Flow rule; Deformation theory of plasticity; Thermoplastic theory; Multisurface plasticity theory; Limit analysis; Slip line fields; Plasticity of concrete and granular materials; Computational plasticity.

CES 704 Soil and Foundation Dynamics

Behavior of dynamically loaded soils: dynamic properties of soils, laboratory and field investigations to determine dynamic soil properties; Dynamic response of soil media to earthquake motions; Soil instabilities due to earthquakes; Vibration of foundations; Soilstructure interaction and its influence on dynamic response of buildings.

CES 705 Theory of Shells

Bending theory of axisymmetric shells: definition of strains, stresses, axisymmetrical loading; Bending theory of cylindrical shell roofs; Membrane theory for shells of revolution; Theory of thick shells: Reissner-Mindlin assumptions, strain and stress representations; Applications.

CES 706 Computational Fracture Mechanics

Stiffness matrix analysis of cracked structures; Finite element formulations for crack problems in structures; Dynamics of fracture mechanics; Elastic-plastic fracture; Prediction of crack propagation in structures subjected to static and dynamic loading.

CES 707 Expert Systems in Structural Engineering

Introduction: What is an expert system, definitions, historical and philosophical aspects; Components of an expert system: knowledge base, inference engine; Basic tasks: knowledge acquisition, knowledge representation; Search techniques: heuristic, forward, backward; Applications: review of current expert system applications in structural engineering, hands on practice using ready made shells; Introduction to PROLOG; Project: develop small scale expert system modules.

CES 708 Reliability of Structures

Uncertainties in structural engineering; Probabilistic models for loads and resistance; Probability of individual failure modes; Reliability of structural systems: parallel, series, and combined systems; Bound and approximate methods; Applications.

CES 709 Seismic Design of Civil Structures

Design philosophy based on seismic capacity; Architectural, environmental, economical and structural considerations; Seismic design of structures: reinforced concrete, steel and masonry; Geotechnical considerations and foundation design; Design of nonstructural systems and components; Ductility, over-strength and strength reduction factor; Performancebased seismic design; International seismic design codes and guidelines; Applications: moment-resisting frames, shear wall buildings and bridges.

CES 710 Advanced Numerical Analysis

Introduction: programming, problem solving, algorithm, flowcharting; Introduction to computer based numerical analysis; Error analysis: modeling, truncation, and round off errors; Linear sets of algebraic equations: singularity, ill-conditioning, and accuracy; Elimination techniques: bounded and symmetric solvers, in-core and out-of-core solvers, skyline and frontal solvers; Eigen value problem: power methods, Jacobi method, eigen analysis of large system; Finite difference equation: forward, backward, central; Galarkine and Ritz methods; Local Ritz technique for finite elements.

CES 711 Nonlinear Analysis of Reinforced Concrete

Plasticity in reinforced concrete: basic properties of steel and concrete, Failure criteria of concrete, constitutive modeling of concrete - Fracture mechanics in concrete: discrete and smeared cracking approaches - Applications using finite elements analysis - Bond modeling and long term deformation - Material and geometric nonlinearities.

CES 712 Composite Materials (2)

Constitutive laws for homogeneous materials: strain energy, elastic symmetry, thermoelastic constants, thermomechanical elastic response, yield function, flow and hardening rules,

thermal effects - Thermoelasticity of composites: effective thermoelastic constants of heterogeneous media, micromechanical models of reinforced solids, bounds on 4 effective properties, thermomechanical coupling, local stress and strain fields - Thermoplasticity theory of composites: overall yield surface, averaging models, periodic array models, bimodal theory, transformation strain method, thermal hardening - Fibrous composite laminates: coordinate transformation, classical theory of symmetric laminated plates, elastothermoplastic constitutive law, thermal hardening.

CES 713 Special Steel Structures

Space structures - Suspended systems - Tubular steel structures - Prestressed systems.

CES 714 Seismic Behavior of Steel Structures (2)

Behavior of lateral load resisting systems under earthquakes: Moment-resisting frames, concentrically-braced frames, eccentrically-braced frames – Modeling of hysteretic behavior – Damping – Advanced energy dissipation mechanisms

CES 715 Steel Bridges (3)

Suspension and cable-stayed bridges: Historical background – Geometrical configuration – Design parameters – Cable stay technology – Static design – Dynamic analysis – Example bridges – Model tests of bridges with slender concrete decks.

CES 716 Optimization of Steel Structures

Objective function and constraints - Design variables - Methods of optimization - Programming: linear, nonlinear, dynamic - Fully stresses design - Application: trusses, frames, towers.

Irrigation & Hydraulics

CEI 501 Hydrodynamics

Equations for Conservation of Mass, Energy, Momentum, Vorticity and Circulation. Stream Function, Velocity Potentials, Basic Flow Fields, Combining Flows By Superposition. Flow Net, Free Streamline Application, Gravity Effects, Introduction to Wave Motion. Computer Applications.

CEI 502 Hydraulic Engineering

Introduction: an Overview of Hydraulic Engineering, Historical Perspectives. Pipelines: Hydraulics of Steady Flow in Closed Conduits, Hydraulics of Unsteady Flow in Pipes, Review of Steady Flow in Open Channels, General Introduction to Mechanics of Sediment Transport, Hydraulic Structures, Dam Appurtenances, Pump Intake Structures, Culvert Hydraulics, Bridge Hydraulics. Physical Modeling: Similitude and Modeling Laws, Application of Modeling Laws, The River Models.

CEI 503 Sediment Transport (1)

Introduction, Hydraulic Properties of Sediments, Modes of Sediment Transportation, Movement of Sediment in The Bed, Suspended Sediment Load, Total Sediment Load, Bed Geometry and Flow Resistance, Stable Channels.

CEI 504 Engineering Hydraulics Laboratory (1)

Introduction, Dimensional Analysis, Similarity Laws, Laboratory Experiments and Demonstration of Flow Measurements, Open Channel Flow Regimes, Sluice Gates, Hydraulic Jump, Flow Characteristics, Flow Control Structures, Analysis of Model Structures.

CEI 505 Irrigation and Drainage Engineering

Definitions and Basic Information, Soil Moisture Water Movement, Water Requirement Calculations, Methods of Surface Irrigation, Sprinkler Irrigation System, Drip Irrigation System, Planning and Design of Irrigation Networks, Irrigation System in Egypt, Water Measurements, Groundwater, Investigations of Drainage Projects and Reclamation of Saline Soils, Open Drains, Tile Drains.

CEI 506 Hydraulic Structures (1)

Classification and Function of Hydraulic Structures, Dams, Design and Stability Analysis of Gravity Dams, Intakes, Spillways, Control Structures, Stilling Basin Design, Advanced Topics in Channel Design, Coastal Structures, Aspects of Theory and Design, Storage Dams, Outlet Works, Gates and Valves, Diversion Works, Drop Structures, Conveyance and Control Structures, Culverts, Flow nets, Seepage Control in Earth Structures, Principles of Project Planning, Methods of Analysis and Hydraulic Design of Storage Systems, Power Projects, Flood Control Projects, Pipeline Networks.

CEI 507 Basics of Coastal and Harbor Engineering

Concepts of Wave Structure Interaction, Harbor and Marine Structures, Laboratory Model, Waves, Planning of Ports, Planning of Coastal Engineering Structures, Terminals, Introduction to Off-Shore Structures.

CEI 508 Ocean Wave Mechanics

Wind, Tides, Currents, Wave Theory and Application to Engineering Problems, Linear and Non-Linear Theories of Regular Gravity Waves, Wave Properties and Transformation in Shoaling Waters, Wave Action Walls and Piles, Wave Statistics, Wave Forces on Structures, Spectral Analysis of Regular Waves.

CEI 509 Inland Navigation

Types of Navigation Channels, Inland Ports, Ship Characteristics, Ship Movements, Hydraulic Phenomena, Ship-Induced Water Motion, Design of Water Section, Side Slopes Revetments, Depth of Channels, Units Towing, Maneuverability at Low Speed, Design of Curves, River Training, Navigation Aids, Mooring Accessories, Dredging, Sounding, Navigation Locks, Bridges.

CEI 510 Environmental Impact Assessment of Irrigation Projects

Terminology, Planning and Management of Impact Studies, Simple Methods of Impact Identification, Environmental Indicators and Indices, Prediction and Assessment of Impacts on Surface and Groundwater Environments, Environmental Monitoring, Major Irrigation Projects in Egypt and Their Impacts.

CEI 511 Coastal Environment Engineering

Shoreline Morpho-Dynamics, Tides and Lakes, Long Term Development of Coasts, Effect of Sea-Level Change on Shorelines, Beach Ecosystems, Coastal Dunes, Coastal Wetlands, Man Activities on The Coast, Dredging Operations, Coastal Water Management, Management of Coastal Sediments, Coastal Hazard.

CEI 512 Topics in Harbor and Coastal Engineering

Selected Topics in The Field of Harbor and Coastal Protection and Inland Navigation Engineering. The Course Title and Outline of What is Required Will Be Submitted Before The Students Register for The Course. A Copy of This Information Will Be Placed in The Student File.

CEI 599 Project

Independent Work Leading to Writing an Extensive Article, Preparing a Theoretical Study or Experimental Work With Complete Analysis in Topic Relevant to The Diploma Field of Study.

CEI 601 Advanced Fluid Mechanics

Fundamentals of Fluid Motion: Kinematics, Lagrangian Formulation, Eulerian Formulation, Conservation of Mass, Flow Mapping. Dynamics of Non-Viscous Fluid Motion: Lagrangian and Eulerian Equations of Motion. Irrotational Motion of an Incompressible Fluid, Foundations for Analysis of Viscous Fluid Motion, Boundary Layer Theory.

CEI 602 Advanced Hydraulics

Advanced Methods of Analyzing Hydraulics and Water Resources Systems. Computation of Unsteady Flow in Open Channels, Abrupt Waves, Flood Waves, Tidal Propagation. Method of Characteristics, Mathematical Modeling of River and Coastal Currents. Modern Concepts of Control Volume and Laminar, Turbulent Flows.

CEI 603 Hydraulic Modeling (2)

Review of Similarity Mechanics and Model Laws. River Models for Transport of Matter and Heat: Basic Concepts, Case Studies. Basin and Reservoir Models, Tidal Models With Fixed or Movable Bed, Models of Hydraulic Structures: Discharge Conditions-Energy Dissipation, Erosion, Vibration and Cavitation. Pipeline Models, Models for Groundwater Flow, Special Models, Computer Applications.

CEI 604 Hydrologic Systems Analysis

Statistics and Probability Analysis of Hydrologic Data, Frequency Analysis, Regression and Correlation Analysis, Analysis of Variance, Covariance, and Time Series, Sequential Generation of Hydrologic Information, Hydrologic Models, Processes and Systems, Applications to Flood and Stream Flow Studies, Rainfall Studies, Stream Flow Studies, Water Quality Studies, and Water Wave Studies.

CEI 605 Groundwater Hydrology (2)

Groundwater Resources, Groundwater Movement, Darcy's Law and Measurement of Permeability, Well Hydraulics, Groundwater Fluctuations, Groundwater Management, Conjunctive Use of Surface Water and Groundwater, Artificial Recharge, Salt Water Intrusion, Flow in Fractured Rocks, Thermal Reservoirs, Flow I The Unsaturated Zone, Multiphase Flow in Porous Media, Quality of Groundwater.

CEI 606 Water Resources Management

Review of Water Resources Management Techniques, Case Studies and Their Applications to Local Conditions, Identification of Major Problems, Implications of Development Alternatives, Legal, Environment, Economical and Social Aspects, Structuring and Solution of Mathematical Models, Decision Analysis, System Simulation, Application of System Analysis Techniques to The Solution of Civil Engineering Problems.

CEI 607 Pump Station Engineering (2)

Station Capacity, Inflow Hydro-Graph, Combined Flow Systems, Station Configuration and Design, Pump Systems, Pump Types, Pump Selection, High Static Head Systems, Large Pump Station Systems, Piping Systems, Fittings, Suction Piping Arrangements, Valves, Flow and Pressure Meters.

CEI 608 Marine Offshore Structures

General Concept, Historical Review of Offshore Structures, Environmental Forces, Active Geological Process, Fixed Offshore Structures, Anchored Offshore Structures, Free Floating Structures, Oil Piers and Auxiliary Facilities, Permanent Drilling Islands, Fixed Drilling and Production Platforms, Mobile Drilling Units, Navigation Aids, Modeling of Forces on Marine Offshore Structures.

CEI 609 Stream Pollution Control

Water Quality Standards, Physical and Chemical Pollution, Bacterial Contamination of Surface Waters. Effects of Specific Types of Pollution Such as Thermal, Point and Non-Point

Sources. Stream Self-Purification, Effects of Lake Eutrophication. Pollution Surveys and Methods of Control.

CEI 610 Engineering Hydraulics Laboratory (2)

Velocity Profiles, Lift and Drag Forces, Similarity Laws, Water Wave Characteristics, Roughened Bed Characteristics, Two-Dimensional Flow Analysis, Mechanics of Sediment Transport, Local Scour, Bed-form Hysteresis, Design of Gauging Structures.

CEI 699 Master Thesis

Public Works

CEP 501 Sanitary Chemistry

Water Quality and Methods of Measurements, Design of Water Quality Measurement Program, Physiological and Physical Properties Such as pH, Hardness, Nitrogen, Phosphorus, Phosphate, Sulfate, Chlorides, Dissolved Oxygen, Chlorine, Iron and Manganese, Water Pollution With Pesticides, Methods of Removal of Dissolved Organic Matter, Methods of Determination of BOD, COD, and TOC.

CEP 502 Bacteriology of Water and Wastewater

Major Groups of Micro Organisms, Advantages of Algae and Its Role in Sewage Treatment, Bacterial Physiology and Metabolism Including Growth Requirements, Action of Micro Organisms Especially Bacteria on Different Substrates, Pollution of Water By Different Microbes, Value and Significance of The Bacteriological Examination, Factors That Influence Bacteria in Water, Indication of Water Pollution By Bacteria, Different Microbial Indicators of Water Pollution and Its Detection, Water Borne Diseases.

CEP 503 Environmental Engineering and Pollution Control (1)

Main Parameters of Environment Impacts on The Projects, Environmental Impacts of The Project on The Human, Environmental Impacts of The Project on The Animals, Environmental Impacts of The Project on The Plants, Environment Impacts of The Project on The Birds, Environmental Impacts of The Project on The Rest of Components of The Environment, Environmental Impacts of The Project During The Construction, Environmental Impacts of The Project After Construction, Governing Laws.

CEP 599 Project

Independent Work Leading to Writing an Extensive Article, Preparing a Theoretical Study or Experimental Work With Complete Analysis in Topic Relevant to The Diploma Field of Study.

CEP 601 Hydraulics of Networks & Plants

Hydraulics Laws for Pipes Design, Pressure Losses & Its Reasons, Effect of Pipe Material, Hydraulic Losses in Plants, Orifices & Weirs Effects, Flow Measurements in Plants, Pump Stations in Networks & Plants.

CEP 602 Chemistry of Water

Water Quality and Methods of Measurements, Ph, Alkalinity, Hardness, Nitrogen, Phosphates Sulfates, DO, Chlorine, Chlorides, Iron and Manganese, Heavy Metal, Insecticides, BOD, COD, TOC.

CEP 603 Microbiology of Water

The Major Groups of Microorganisms, Value and Significance of Micro-Biological Examinations, Pollution of Water By Different Microorganisms, Microbial Indicators of Water Pollution and Its Detection.

CEP 604 Advanced Water Treatment

Theory of Coagulation and Flocculation, Theory of Filtration, Types of Filters, Iron and Manganese Removal, Adsorption, Water Softening, Removal of Traces, Organic Matters and Heavy Metals.

CEP 605 Advanced Domestic Wastewater Treatment

Methods of Ammonia Removal, Nitrate Removal, Phosphorus Removal, Chemical Treatment, Filtration Treatment By Using Activated Carbon, Anaerobic Treatment.

CEP 606 Advanced Sludge Treatment

Advanced Studies on The Following Topics: Characteristics and Volume of Sludge, Sludge Handling, Sludge Stabilization, Thermal Processing of Sludge, Ultimate Disposal and Utilization of Sludge, Sludge Denaturing.

CEP 607 Water Treatment Modeling

Water Modeling for Physical Properties & Chemical Actions with Hydraulic Equations, Applied Models for Coagulation and Flocculation, Filtration, Iron and Manganese Removal Methods, Adsorption, Disinfection, Water Softening, Removal of Traces, Organic Matters and Heavy Metals.

CEP 608 Waste water Treatment Modeling

Water Modeling for Physical Properties, Chemical & Biological Actions with Hydraulic Equations, Applied Models for Primary Treatment Methods, Attached Growth Biological Treatment, Suspended Growth Biological Treatment, Stabilization Ponds, Aerated Lagoons, Anaerobic Treatment, Chemical Treatment, Treatment with Activated Carbon.

CEP 609 Water Supply Systems Modeling

Water Modeling for Physical Properties with Hydraulic Equations, Applied Models for Water Supply Networks Planning, Water Piping Systems Hydraulic Design, Water Supply Pipes Materials, Appurtenance of Water Supply Pipes, Pumping Stations, Design of Carrier Lines, Water Hammer, Test of Water Lines, Valves & Control of Water Supply Networks.

CEP 610 Sewerage Systems Modeling

Water Modeling for Physical Properties with Hydraulic Equations, Applied Models for Planning of Collection System, Hydraulic Design of Gravity Sewers, Sewers Materials, Appurtenance of Sewers, Biological Decomposition in Sewers, Pumping Stations, Design of Force Mains, Water Hammer in Force Mains, Test of Sewers.

CEP 611 Networks Operation & Maintenance Programs

Main Requirements for Operation of Water Supply & Sanitation Networks, Performance Evaluation for Networks, Evaluation & Follow up of Networks Operation, Periodical Operation Programs, Periodical Maintenance Programs, Environmental Impacts.

CEP 612 Sea Water Desalination

Need to Desalination, Properties of Fresh & Saline Water, Engineering and Economic Considerations, Methods of Desalination, Problems Common to Distillation, Multiple Effect Desalination, Multiple Stage Slash Distillation, Vapor Compression Distillation, Combined Distillation Plants, Distillation with Non-Fuel Energy Sources, Ion Exchange, Electro-Dialysis, Reverse Osmosis, Design of Desalination Plants.

CEP 613 Reuse of Solid Wastes

Methods of Domestic Wastewater Reuse, Environmental Impact for Domestic Wastewater Reuse, Methods of Industrial Wastewater Reuse, Recycling of Industrial Wastewater, Environmental Impact for Industrial Wastewater Reuse.

CEP 614 Sludge Disposal & Reuse

Sludge Disposal in Water Treatment Plants, Sludge Disposal in Wastewater Treatment Plants, Sludge Disposal in Industrial Wastewater Treatment Plants, Methods of Sludge Reuse, Environmental Impact for Sludge Reuse.

CEP 615 Utilities Networks Planning & Its Economy

Types of Utilities Networks, Water Supply Distribution Networks Types, Sewerage Systems Types, Basics of Urban Planning, Planning of Water Supply Networks for Different Purposes, Planning of sewerage systems, Intersections with Gas, Electricity and Communication Networks, Public Utilities Economy.

CEP 699 Master Thesis