Department of Civil Engineering: Syllabi for New Curriculum

Modules offered by the Department to Civil Engineering Students

<table>
<tr><td>Module Code</td><td>CE1022</td><td>Module Title</td><td colspan="4">Fluid Mechanics</td></tr>
<tr><td>Credits</td><td>2</td><td rowspan="2">Hours/Week</td><td>Lectures</td><td>2</td><td rowspan="2">Pre – requisites</td><td rowspan="2">None</td></tr>
<tr><td>GPA/NGPA</td><td>GPA</td><td>Lab/Assignments</td><td>3/4</td></tr>
<tr><td colspan="7"><u>Learning Outcomes</u>
• Ability to identify important fluid properties and flow characteristics and assess their significance in the applications of Fluid Mechanics in Engineering Practice;
• Ability to determine hydrostatic forces and use them to assess the equilibrium and stability conditions of submerged and floating bodies;
• Ability to apply concepts on the conservation of mass, energy and momentum of fluids in the applications of Fluid Mechanics in Engineering practice.</td></tr>
<tr><td colspan="7"><u>Outline Syllabus</u>
• Introduction: Applications of Fluid Mechanics in Engineering Practice, Historical development of Fluid Mechanics.
• Fluids: Characteristics of fluids, Continuum concept, Fluid properties: Density, Specific Weight, Relative Density, Viscosity, Bulk Modulus, Vapour Pressure, Surface Tension, Significance of fluid properties in Engineering Applications.
• Hydrostatic Pressure : Variation of hydrostatic pressure, Pressure and Piezometric head, Absolute and Gauge pressure, Pressure diagram, Measurement of pressure: Barometer, Piezometer, Manometer, Pressure gauges.
• Hydrostatic Thrust : Hydrostatic thrust on plane and curved surfaces, Centre of pressure.
• Buoyancy: Upthrust on submerged bodies, Archimedes principle, Centre of Buoyancy, Equilibrium and stability of fully submerged bodies, Metacentre, Equilibrium and stability of floating bodies, Time period of oscillation of floating bodies, Effect of liquid cargo.
• Relative equilibrium: Relative equilibrium of fluids under linear acceleration, Forced vortex motion.
• Fluids in Motion: Concepts of fluid flow, Fluid kinematics, Flow classification: Uniform/Non uniform flow, Steady/Unsteady flow, Incompressible/Compressible flow, Laminar/Turbulent flow, Irrotational/Rotational flow, Acceleration of a fluid particle, Techniques of fluid flow analysis.
• Conservation of mass: Continuity equation and applications.
• Conservation of energy: Bernoulli’s equation, Datum, Pressure, Velocity, Piezometric and Total head, Head losses, Steady flow energy equation, Applications in pipe flow.
• Conservation of momentum: Steady flow momentum equation and applications.
• Hydraulic machinery: Centrifugal pumps, Performance and system characteristics, Operating point. Turbines.</td></tr>
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<table>
<tr><td>Module Code</td><td>CE1952</td><td>Module Title</td><td colspan="4">Engineering Design</td></tr>
<tr><td>Credits</td><td>1.5</td><td rowspan="2">Hours/Week</td><td>Lectures</td><td>2</td><td rowspan="2">Pre – requisites</td><td rowspan="2">None</td></tr>
<tr><td>GPA/NGPA</td><td>NGPA</td><td>Lab/Assignments</td><td>3</td></tr>
<tr><td colspan="7"><u>Learning Outcomes</u>

After completing this course, the students will be able to,
• Demonstrate the ability to understand Design Principles
• Demonstrate the ability to understand various aspects of design in several selected design case studies.
• Carry out a group based product design assignment addressing issues such as manufacturability, marketability, creativity, team work, meeting dead lines.</td></tr>
<tr><td colspan="7"><u>Outline Syllabus</u>

Module 1: Design principles
• Introduction to Engineering Design
• Life Cycle of Engineering Products and Processes
• Design process and Design Tools
• Concurrent Engineering
• Creativity and Reasoning
• Analysis, synthesis, simulation, evaluation and decision making

Module 2: Case studies
Several simple but comprehensive design case studies selected from different disciplines of engineering addressing following topics:
• Design for manufacturing
• Mechanical and material aspect in design
• Electrical, Electronic and IT aspects in Design

Module 3: Design assignments
Group based design assignments
Students will be asked to design artifacts such as (i) Bus stand (ii) Ladder (iii) Water tank, using conceptual design steps such as Objectives trees, Function means trees, Morphological charts, Comparison of alternatives</td></tr>
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<table>
<tr><td>Module Code</td><td>CE1962</td><td>Module Title</td><td colspan="4">Engineering Skill Development</td></tr>
<tr><td>Credits</td><td>1.0</td><td rowspan="2">Hours/Week</td><td>Lectures</td><td>0.5</td><td rowspan="2">Pre – requisites</td><td rowspan="2">None</td></tr>
<tr><td>GPA/NGPA</td><td>NGPA</td><td>Lab/Assignments</td><td>6</td></tr>
<tr><td colspan="7"><u>Learning Outcomes</u>

Familiarity with computer and drawing skills, and with surveying instruments.</td></tr>
<tr><td colspan="7"><u>Outline Syllabus</u>

BC Drawing : Basic fundamentals of building construction drawing inclusive of hand drawing classes

Sketching : Sketching of a steel structure

CAD : Introduction to computer aided drafting

Spreadsheet : Production of an EXCEL application

Surveying : Introduction to Theodolite, Level, Chain, Tapes and accessories</td></tr>
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<table>
<tr><td>Module Code</td><td>CE1112</td><td>Module Title</td><td colspan="4">Structural Mechanics I</td></tr>
<tr><td>Credits</td><td>3</td><td rowspan="2">Hours/Week</td><td>Lectures</td><td>2.5</td><td rowspan="2">Pre – requisites</td><td rowspan="2">ME1012</td></tr>
<tr><td>GPA/NGPA</td><td>GPA</td><td>Lab/Assignments</td><td>3/2</td></tr>
<tr><td colspan="7"><u>Learning Outcomes</u>
Ability to compute the stresses, strains and deformations due to applied forces in structural elements.</td></tr>
<tr><td colspan="7"><u>Outline Syllabus</u>
Bending stresses
Transverse shear stresses
Torsion
Deflection of beams
Buckling of struts</td></tr>
</table>

<table>
<tr><td>Module Code</td><td>CE1122</td><td>Module Title</td><td colspan="4">Fluid Mechanics II</td></tr>
<tr><td>Credits</td><td>3</td><td rowspan="2">Hours/Week</td><td>Lectures</td><td>2.5</td><td rowspan="2">Pre – requisites</td><td rowspan="2">CE1022</td></tr>
<tr><td>GPA/NGPA</td><td>GPA</td><td>Lab/Assignments</td><td>3/2</td></tr>
<tr><td colspan="7"><u>Learning Outcomes</u>
Ability to determine head losses and flow rates in pipe flow and design pipeline systems, pipe networks-by iterative methods-and power transmission pipe systems;
Ability to identify suitable types of flow measuring devices and calculate the flow rates through them for various Engineering Applications;
Ability to determine velocity, discharge and optimum cross section under steady uniform flow conditions and to design simple channel systems; and
Ability to use the mathematical concepts in ideal fluid flow to simulate various flow conditions in Engineering Practice.</td></tr>
<tr><td colspan="7"><u>Outline Syllabus</u>
Pipe Flow: Laminar and Turbulent flow in pipes, Velocity profiles, Kinetic and Momentum correction factors, Flow rate, Frictional head loss, Reynolds experiment, Hagen-Poiseuille equation, Darcy-Weisbach equation, Variation of friction factor, Colebrook-White equation, Solution techniques: Moody diagram, Hydraulic Research Station Design Charts and Tables, Hagen-Williams equation, Local losses in pipes, Energy Grade Line, Hydraulic Grade Line, Cavitation, Power transmission through pipelines, Analysis and Design of pipeline systems.
Pipe networks: Analysis of pipe networks by iterative methods: Head balancing and Quantity balancing methods
Flow measurement: Venturimeter, Orifice meter, Pitot tube, Orifices, Sharp edged Notches/Weirs, Current metering and rating curves, Dilution gauging.
Steady Uniform Flow in Open Channels:Velocity formulae: Chezy and Manning formulae, Optimum channel section.
Ideal flow: Two dimensional ideal flow of fluids, Vorticity, Circulation, Velocity Potential and Stream function, Flow nets, Basic flow patterns and combinations: Source, Sink, Vortex, Doublet, Simulation of flow patterns, Limitations.
Flow of real fluids: Navier-Stokes equation</td></tr>
</table>

<table>
<tr><td>Module Code</td><td>CE1132</td><td>Module Title</td><td colspan="4">Building Construction and Materials</td></tr>
<tr><td>Credits</td><td>3</td><td rowspan="2">Hours/Week</td><td>Lectures</td><td>2</td><td rowspan="2">Pre – requisites</td><td rowspan="2">None</td></tr>
<tr><td>GPA/NGPA</td><td>GPA</td><td>Lab/Assignments</td><td>3</td></tr>
<tr><td colspan="7"><u>Learning Outcomes</u>

• Ability to identify and use building materials in construction applications based on ICTAD specifications and relevant standards;
• Ability to execute construction of buildings up to five stories based on detail construction drawings, ICTAD specifications and relevant standards; and
• Ability to identify and use sustainable construction materials and methods.</td></tr>
<tr><td colspan="7"><u>Outline Syllabus</u>

• Identification of building elements, theory and practice related to detail construction drawings and its use in the construction of buildings up to five stories.
• Identification and use of suitable building materials and construction methods which satisfy ICTAD specifications and other relevant standards for foundations, walls, doors and windows, roofs, ceiling, floors and finishes.
• An introduction to suitable building materials and construction methods for services in buildings including water, sanitary facilities, electricity, fire fighting, air-conditioning and lifts.
• New construction materials and methods with an introduction to sustainable construction.
• Manufacturing processes, properties, specifications and test methods for major construction materials including cement, steel, bricks, timber, concrete aggregates, sand, roof covering materials, pipes and fittings.</td></tr>
</table>

<table>
<tr><td>Module Code</td><td>CE2712</td><td>Module Title</td><td colspan="4">Building Design Process</td></tr>
<tr><td>Credits</td><td>2.0</td><td rowspan="2">Hours/Week</td><td>Lectures</td><td>1.0</td><td rowspan="2">Pre – requisites</td><td rowspan="2">None</td></tr>
<tr><td>GPA/NGPA</td><td>GPA</td><td>Lab/Assignments</td><td>3.0</td></tr>
<tr><td colspan="7"><u>Learning Outcomes</u>

• Ability to appreciate the roles of different professions in the design team
• Ability to apply building regulations to residential, commercial and public buildings.
• Ability to apply basic building planning concepts for activity spaces and means of circulation
• Ability to produce building drawing using computer tools.</td></tr>
<tr><td colspan="7"><u>Outline Syllabus</u>

• The planning process including urban planning, subdivision of land, zones of planning, various authorizes in Sri Lanka and their respective roles.
• Building design team : Roles of different professional including Architect, Structural Engineer, Fire Engineer, Mechanical, Electrical Engineer and Quantity Surveyor
• Introduction to standards and specifications for building design.
• Architectural practice : Aesthetics, planning of spaces, Bubble diagrams, Form and function of buildings, appreciation of historical and modern architecture, Aesthetics and spatial relationships, appreciation of interior design.
• Computer Aided Drafting/ Manual Drawings, production of detail drawings for construction</td></tr>
</table>

<table>
<tr><td>Module Code</td><td>CE2012</td><td>Module Title</td><td colspan="4">Structural Mechanics II</td></tr>
<tr><td>Credits</td><td>3</td><td rowspan="2">Hours/Week</td><td>Lectures</td><td>2.5</td><td rowspan="2">Pre – requisites</td><td rowspan="2">CE1112</td></tr>
<tr><td>GPA/NGPA</td><td>GPA</td><td>Lab/Assignments</td><td>3/2</td></tr>
<tr><td colspan="7"><u>Learning Outcomes</u>
• Ability to appreciate different failure mechanisms in materials and structures.</td></tr>
<tr><td colspan="7"><u>Outline Syllabus</u>
• Analysis of stress and strain
• Theories of elastic failure
• Influence lines
• Plastic analysis of continuous beams & frames
• Yield line theory</td></tr>
</table>

<table>
<tr><td>Module Code</td><td>CE2022</td><td>Module Title</td><td colspan="4">Design of Steel Structures</td></tr>
<tr><td>Credits</td><td>3</td><td rowspan="2">Hours/Week</td><td>Lectures</td><td>2</td><td rowspan="2">Pre – requisites</td><td rowspan="2">CE1112</td></tr>
<tr><td>GPA/NGPA</td><td>GPA</td><td>Lab/Assignments</td><td>3</td></tr>
<tr><td colspan="7"><u>Learning Outcomes</u>

• Ability to design steel members in civil engineering structures.</td></tr>
<tr><td colspan="7"><u>Outline Syllabus</u>

• Introduction to the process of design
• Types of loads, their effects and load paths
• Properties of steel in relation to design
• Design of steel members subject to tension, compression and bending
• Design of steel connections
• Design Failures</td></tr>
</table>

Module Code	CE2032	**Module Title**	Hydraulic Engineering I			
Credits	3	**Hours/Week**	**Lectures**	2.5	**Pre – requisites**	CE1122
GPA/NGPA	GPA		**Lab/Assignments**	3/2		

Learning Outcomes

- Ability to apply the concepts of Dimensional Analysis and Similarity and the techniques in Physical Modelling to assess the flow conditions in relevant Engineering applications;
- Ability to assess the effect of boundary layer on the flow over solid surfaces and bodies;
- Ability to use the pump/turbine and pipeline characteristics to design pump/turbine-pipeline systems;
- Ability to determine surge pressures in pipe flow and analyze and design surge tanks.

Outline Syllabus

- Dimensional & Hydraulic Model Analysis: Fundamental and derived dimensions, Dimensional homogeneity, Buckingham's Pi theorem, Significance of dimensionless groups, Theory of hydraulic models, Froude and Reynolds models, Distorted models, Resistance for ships.
- Boundary Layer Theory: Laminar and turbulent boundary layers, Displacement thickness, Momentum thickness, Drag on a flat plate, Determination of coefficient of drag for laminar and turbulent boundary layer, Boundary layer theory related to pipe flow.
- Hydraulic Machinery [10 hours]– Introduction to types of hydraulic machinery, Reciprocating pumps-volumetric efficiency, indicator diagrams, inertia pressure, cavitation, use of air vessels, Rotodynamic machines- centrifugal pumps - characteristic curves efficiency, specific speed, operation of pumps; Turbines- Pelton wheel, maximum efficiency, speed control of Pelton wheel, Francis and Kaplan Turbines, Guide vanes, draft tubes, specific speed, efficiency, unit speed, unit power, characteristic curves for turbines, pipelines with pumps.
- Hydraulic Transients [10 hours]- Water hammer- unsteady flow in closed pipeline systems, fundamental differential equations of water hammer, velocity of propagation, sudden and gradual closure and opening of valves; Surge tanks- purpose and types, theory of mass oscillation, friction effects, simple finite difference solution.

<table>
<tr><td>Module Code</td><td>CE2042</td><td>Module Title</td><td colspan="4">Soil Mechanics and Geology I</td></tr>
<tr><td>Credits</td><td>3</td><td rowspan="2">Hours/Week</td><td>Lectures</td><td>2</td><td rowspan="2">Pre – requisites</td><td rowspan="2">None</td></tr>
<tr><td>GPA/NGPA</td><td>GPA</td><td>Lab/Assignments</td><td>3</td></tr>
<tr><td colspan="7"><u>Learning Outcomes</u>

• Ability to understand the formation of rocks and soils;
• Ability to understand the fundamental concepts of geological mapping;
• Ability to understand the fundamental properties of soils and rocks;
• Ability to classify soils, select borrow pit materials, and assess soil compaction;
• Ability to design an earth-fill.</td></tr>
<tr><td colspan="7"><u>Outline Syllabus</u>
Geology:

• Geological history and Internal structure of the Earth

• Crust of the Earth: composition, strata, minor and major instrusions; tectonic plates, earthquakes, volcanoes, ridges, trenches, subduction.

• Internal and surface processes: weathering, erosion, transportation, deposition, lithification, uplift, volcanism, plutonism, metamorphism, melting, mountains.

• Rock forming minerals : silicate and non-silicate minerals

• Soils on the Earth’s surface : glacial, aeolian, alluvial, and residual soils.

Soil Mechanics:

• Basic Properties of Soils; Formation of soils, mass volume relationships
• Particle Size Analysis; sieve analysis, hydrometer analysis
• Plasticity ; Clay minerals, Atterberg limits, Plasticity chart
• Classification of soils according to unified classification system
• Compaction of Soils : Effects of soil type water content and compaction effort, Standard and modified Proctor compaction tests, Air voids lines, Methods of compaction in the field and quality control</td></tr>
</table>

<table>
<tr><td>Module Code</td><td>CE2052</td><td>Module Title</td><td colspan="4">Construction Planning and Cost Estimating</td></tr>
<tr><td>Credits</td><td>3</td><td rowspan="2">Hours/Week</td><td>Lectures</td><td>2</td><td rowspan="2">Pre – requisites</td><td rowspan="2">CE1132</td></tr>
<tr><td>GPA/NGPA</td><td>GPA</td><td>Lab/Assignments</td><td>3</td></tr>
<tr><td colspan="7"><u>Learning Outcomes</u>

• Ability to read construction drawings and use of those for the preparation cost estimates and interim valuations;
• Ability to prepare Bills of Quantities and interim valuations of a construction project for the requirements of standards and specifications;
• Skills to prepare construction plans for a project using computer tools;
• Ability to check the compliance of Building regulations of a building.</td></tr>
<tr><td colspan="7"><u>Outline Syllabus</u>

• Construction Drawings: Preparation of drawings using computer tools such as AutoCAD, extracting information from drawings for the preparation of Bills of quantities and interim valuations. A special emphasis to be made on detail drawings.
• Preparation of Bills of quantities: Centre line method, Taking off methods and calculations of quantities. Preparation of Bills of quantities for the requirements given in SLS 573 and similar standards. Pricing methods and calculation of unit rates of construction work.
• Construction Planning: Planning methods such as Activity on Node (AON) and Activity on Arrow(AOA), critical path methods, extracting estimating data for planning work and applications of MS Project Computer tool.
• Introduction to building regulations</td></tr>
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<table>
<tr><td>Module Code</td><td>CE2062</td><td>Module Title</td><td colspan="4">Surveying I</td></tr>
<tr><td>Credits</td><td>3</td><td rowspan="2">Hours/Week</td><td>Lectures</td><td>2</td><td rowspan="2">Pre – requisites</td><td rowspan="2">None</td></tr>
<tr><td>GPA/NGPA</td><td>GPA</td><td>Lab/Assignments</td><td>3</td></tr>
<tr><td colspan="7"><u>Learning Outcomes</u>

• Ability to understand the use of survey measurements in civil engineering.
• Ability to use chain, level and theodolite in the field for survey measurements.
• Ability to produce hand-drawn survey plans and LS/CS drawings.</td></tr>
<tr><td colspan="7"><u>Outline Syllabus</u>

• Introduction to Land Surveying: Classification of surveying; principles of surveying; methods of surveying; true bearing and magnetic bearing; linear and angular measurements; scale and maps; errors in measurements; coordinates on the Earth’s surface.

• Linear Measurements and Chain Surveying: Chain, tape and accessory instruments; survey stations and lines; offsets, field procedure; booking procedure; plotting; errors and corrections.

• Levelling and Contouring: Levels; leveling staff; reduced level and level differences; rise and fall; height of collimation; booking procedures; fly-back; longitudinal and cross-sections; errors and corrections; curvature and refraction; contours and contouring.

• Theodolite Surveying: Vernier and Glass-circle Theodolites; measurement of horizontal and vertical angles; bearings; methods of traversing; angular and linear errors; correction of coordinates.

• Tacheometry: Principles of optical distance measurement; levels and distances using tacheometry.</td></tr>
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<table>
<tr><td>Module Code</td><td>CE2112</td><td>Module Title</td><td colspan="4">Structural Analysis I</td></tr>
<tr><td>Credits</td><td>3</td><td rowspan="2">Hours/Week</td><td>Lectures</td><td>2.5</td><td rowspan="2">Pre – requisites</td><td rowspan="2">CE1112</td></tr>
<tr><td>GPA/NGPA</td><td>GPA</td><td>Lab/Assignments</td><td>3/2</td></tr>
<tr><td colspan="7"><u>Learning Outcomes</u>

• Ability to analyse statically indeterminate structures.</td></tr>
<tr><td colspan="7"><u>Outline Syllabus</u>

• Energy theorems
• Moment distribution method
• Generalized Matrix method</td></tr>
</table>

<table>
<tr><td>Module Code</td><td>CE2122</td><td>Module Title</td><td colspan="4">Design of Concrete Structures I</td></tr>
<tr><td>Credits</td><td>3</td><td rowspan="2">Hours/Week</td><td>Lectures</td><td>2</td><td rowspan="2">Pre – requisites</td><td rowspan="2">CE1112</td></tr>
<tr><td>GPA/NGPA</td><td>GPA</td><td>Lab/Assignments</td><td>3</td></tr>
<tr><td colspan="7"><u>Learning Outcomes</u>
• Ability to design reinforced concrete medium rise buildings.</td></tr>
<tr><td colspan="7"><u>Outline Syllabus</u>
• Introduction to reinforced concrete with multi-storey buildings
• Preliminary design concepts
• Design of slabs, beams, columns (short or slender), bases, staircases, walls, flat slabs, redistribution of moments, robustness
• Detailing aspects</td></tr>
</table>

<table>
<tr><td>Module Code</td><td>CE3012</td><td>Module Title</td><td colspan="4">Hydraulic Engineering II</td></tr>
<tr><td>Credits</td><td>3</td><td rowspan="2">Hours/Week</td><td>Lectures</td><td>2.5</td><td rowspan="2">Pre – requisites</td><td rowspan="2">CE2032</td></tr>
<tr><td>GPA/NGPA</td><td>GPA</td><td>Lab/Assignments</td><td>3/2</td></tr>
<tr><td colspan="7"><u>Learning Outcomes</u>

• Ability to apply principles of hydraulics to typical open channel flow problems leading to the design of channel networks and control structures;
• A thorough understanding of principles of surface and ground water hydrology with application of flood estimation and reserviour design;
• Ability to apply the principles of fluid mechanics and hydraulics to study dynamic coastal environment and understanding wave induced processes and the impacts on the coastline.</td></tr>
<tr><td colspan="7"><u>Outline Syllabus</u>

• Steady, Non Uniform Flow in Open Channels: Specific energy, Classification of flow profiles, Critical, Sub-critical, Super-critical flow, Evaluation of flow profiles using graphical, numerical and analytical methods, Hydraulic jump, Flow from a reservoir through a channel, Flow at a clear overfall, Hydraulic structures. Design of Open Channels- Design parameters, design considerations and design procedure applicable to non erodible and erodible channels.
• Hydrology and water resource management: Hydrologic cycle-precipitation, infiltration, evaporation and runoff. Water balance. Measurement and analysis of precipitation. Losses-infiltration and evaporation measurement. Runoff-design flood estimation, rational method, unit hydrograph, base flow separation. Flood routing through channels. Design and operation of reservoirs-mass flow curves, estimation of reservoir capacity. Ground water flow-hydrogeology of an area, aquifers, equations of motion, analysis of pumping test data. Integrated Water Resources Management.
• Coastal Hydraulics: Introduction to coastal environment, Introduction to deterministic wave theories, Small amplitude wave theory, Particle motion, Wave induced processes, Group velocity, Wave energy.</td></tr>
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<table>
<tr><td>Module Code</td><td>CE2132</td><td>Module Title</td><td colspan="4">Soil Mechanics and Geology II</td></tr>
<tr><td>Credits</td><td>3</td><td rowspan="2">Hours/Week</td><td>Lectures</td><td>2</td><td rowspan="2">Pre – requisites</td><td rowspan="2">CE2042</td></tr>
<tr><td>GPA/NGPA</td><td>GPA</td><td>Lab/Assignments</td><td>3</td></tr>
<tr><td colspan="7"><u>Learning Outcomes</u>

• Ability to classify rocks and understand geological structures;
• Ability to interpret geological maps with structures;
• Ability to understand flow of water through soils and rocks; and
• Ability to estimate settlements due to consolidation.</td></tr>
<tr><td colspan="7"><u>Outline Syllabus</u>
Geology:

• Igneous, Sedimentary and Metamorphic rocks: environments of rock formations, rock forms, rock types, and characteristics.

• Geological structures: dip, strike, strata, lava flows, minor and major intrusive forms, faults, folds, unconformities, surface features.

• Hydrogeology: hydrological cycle, aquifers and aquicludes, infiltration, percolation, ground water flow, rivers, springs, wells.

Soil Mechanics:

• Flow of Water through soils; Concept of head, Energy equation, One dimensional flow, Coefficient of Permeability, Determination of the coefficient of permeability in the lab and in-situ, Equivalent permeability, Two dimensional flow, Equation of continuity and Laplarce equations, Analysis of two dimensional flow with flow nets, seepage force, quick condition.

Consolidation: Concept of consolidation, Terzaghi’s theory for one dimensional consolidation, Determination of consolidation characteristics in the laboratory, Stress distributions in the soils, Estimation of amount and rate of settlement due to structures, consolidation due to dewatering, secondary consolidation, improvement of soft clays by preloading.

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<table>
<tr><td>Module Code</td><td>CE2142</td><td>Module Title</td><td colspan="4">Surveying II</td></tr>
<tr><td>Credits</td><td>3</td><td rowspan="2">Hours/Week</td><td>Lectures</td><td>2</td><td rowspan="2">Pre – requisites</td><td rowspan="2">CE2062</td></tr>
<tr><td>GPA/NGPA</td><td>GPA</td><td>Lab/Assignments</td><td>3</td></tr>
<tr><td colspan="7"><u>Learning Outcomes</u>
Ability to use modern instruments for survey measurements in civil engineering applications;
Ability to make computations for civil engineering works based on survey measurements;
Ability to set out civil engineering works; and
Ability to understand the use of field astronomy for survey and time measurements</td></tr>
<tr><td colspan="7"><u>Outline Syllabus</u>
Modern techniques and instruments:
Electromagnetic Distance Measurement (EDM): Maximum non-ambiguous distance, principles of modulation and simulation, Total Station (TS) to measure inclined distances, tie distances, coordinates, levels and angles.
Global Positioning System (GPS): Satellite systems, principles of measurement, errors, uses, differential GPS.
Areas, Volumes and Earthwork: Areas using geometrical figures and formulae, areas using planimeter, volumes/ earthwork by end-areas and trapezoidal formulae, by spot levels, and by contours.
Field Astronomy and Time: Movement of Earth in space; celestial sphere; constellations; apparent motion of stars; determination of true north and coordinates; axial tilt of the Earth; seasons; apparent motion of sun in the celestial sphere; solar time and sidereal time; standard time.
Setting-out: Curves; curve ranging using chain/tape, theodolite, and TS; setting-out of buildings; horizontal and vertical alignment.
Introduction to surveying software (03 hours): AutoCAD for survey plans; other surveying software.</td></tr>
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<table>
<tr><td>Module Code</td><td>CE3112</td><td>Module Title</td><td colspan="4">Structural Analysis II</td></tr>
<tr><td>Credits</td><td>3</td><td rowspan="2">Hours/Week</td><td>Lectures</td><td>2.5</td><td rowspan="2">Pre – requisites</td><td rowspan="2">CE2112</td></tr>
<tr><td>GPA/NGPA</td><td>GPA</td><td>Lab/Assignments</td><td>3/2</td></tr>
<tr><td colspan="7"><u>Learning Outcomes</u>
• Ability to analyse complicated statically indeterminate structures.</td></tr>
<tr><td colspan="7"><u>Outline Syllabus</u>

• Finite element analysis
• Modeling of structures
• Plates and shells
• Introduction to structural dynamics</td></tr>
</table>

<table>
<tr><td>Module Code</td><td>CE3122</td><td>Module Title</td><td colspan="4">Design of Masonry and Timber Structures</td></tr>
<tr><td>Credits</td><td>3</td><td rowspan="2">Hours/Week</td><td>Lectures</td><td>2</td><td rowspan="2">Pre – requisites</td><td rowspan="2">CE1112</td></tr>
<tr><td>GPA/NGPA</td><td>GPA</td><td>Lab/Assignments</td><td>3</td></tr>
<tr><td colspan="7"><u>Learning Outcomes</u>
• Ability to design loadbearing masonry structures; and
• Ability to design timber members in civil engineering structures.</td></tr>
<tr><td colspan="7"><u>Outline Syllabus</u>

• Use of Masonry as a structural material
• Design of loadbearing masonry for vertical, lateral and inplane loads
• Design of infill panels
• Use of timber as a structural material
• Design of timber members subject to tension, compression and bending
• Design of nailed and bolted timber connections</td></tr>
</table>

<table>
<tr><td>Module Code</td><td>CE 3132</td><td>Module Title</td><td colspan="4">Geotechnical Engineering</td></tr>
<tr><td>Credits</td><td>3</td><td rowspan="2">Hours/Week</td><td>Lectures</td><td>2.5</td><td rowspan="2">Pre – requisites</td><td rowspan="2">CE2132</td></tr>
<tr><td>GPA/NGPA</td><td>GPA</td><td>Lab/Assignments</td><td>3/2</td></tr>
<tr><td colspan="7"><u>Learning Outcomes</u>

• Ability to understand basic mechanical and physical behavior of rock masses and design of rock slopes;
• Ability to apply the shear strength concept in geotechnical problems;
• Ability to assess the stability of soil slopes.</td></tr>
<tr><td colspan="7"><u>Outline Syllabus</u>

• Shear Strength;:
Relevance of shear strength of soils, Mohr Coulomb failure criterion, Drained and undrained conditions, Determination of shear strength in the laboratory by Direct shear test and triaxial tests, applicability of different types of triaxial tests, Pore water pressure development and Skempton’s law, Stress invariants and stress paths, Vane shear test, Shear strength of unsaturated soils

• Rock Mechanics:
Rock mass and rock material, discontinuities, rock mass classification, investigation in rock, orientation of discontinuities, stereo-plots, stability of rock slopes: plane failure and wedge failure; stabilization of rock slopes.

• Stability of Soil Slopes:
Different modes of slope instability, Drained and undrained behaviour, shallow translational slides, Analysis of rotational slides by friction circle method, Taylor’s chats, Bishop and Morgenstern charts, Ordinary slices method, Bishop’s method of slices, concept of probability of failure, Stabilization of slopes.</td></tr>
</table>

<table>
<tr><td>Module Code</td><td>CE3142</td><td>Module Title</td><td colspan="4">Construction Management</td></tr>
<tr><td>Credits</td><td>3</td><td rowspan="2">Hours/Week</td><td>Lectures</td><td>2</td><td rowspan="2">Pre – requisites</td><td rowspan="2">CE2052</td></tr>
<tr><td>GPA/NGPA</td><td>GPA</td><td>Lab/Assignments</td><td>3</td></tr>
<tr><td colspan="7"><u>Learning Outcomes</u>

• Ability to perform site management as a Junior Engineer in a construction site;
• Skills to prepare a contract document for a construction project based on ICTAD and government guidelines;
• Skills to plan a new construction site for material storage, site offices and accommodation;
• Ability to prepare routine management reports related to construction work; and
• Skills to perform work study in a construction site or in an office</td></tr>
<tr><td colspan="7"><u>Outline Syllabus</u>

• Applications of work study, activity sampling, incentives and plant management for construction sites.
• Introduction to law of contract. Preparation of contract documents for the requirement of ICTAD conditions of contracts and government procurement guidelines.
• Quality Management in Construction – concepts of quality, cost of quality, ISO 9000 standards.
• Health and Safety in Construction – health and safety regulations, specifications, insurance.
• Site Organisation and Management.
• Computer related tools and techniques for estimating, cost control, cash flow and interim valuations.</td></tr>
</table>

<table>
<tr><td>Module Code</td><td>CE3152</td><td>Module Title</td><td colspan="4">Fundamentals of Environmental Engineering</td></tr>
<tr><td>Credits</td><td>2</td><td rowspan="2">Hours/Week</td><td>Lectures</td><td>1.5</td><td rowspan="2">Pre – requisites</td><td rowspan="2">None</td></tr>
<tr><td>GPA/NGPA</td><td>GPA</td><td>Lab/Assignments</td><td>3/2</td></tr>
<tr><td colspan="7"><u>Learning Outcomes</u>
Ability to perceive/examine what causes environmental problems, assess the magnitude of environmental consequences related to human activities and predict consequences; and
Ability to analyze a given scenario based on key environmental concepts and to develop solutions to environmental-related problems.</td></tr>
<tr><td colspan="7"><u>Outline Syllabus</u>
Introduction to Environmental Engineering
Principles of Ecology, Resource constraints and threats to Earth’s life support system
Sustainability and development, Risk assessment, Global environmental issues
Environmental Quality
Pollution in Surface and Ground Water and its control
Solid and Hazardous Waste Management
Air Pollution and Noise Control
Environmental Impact Assessment</td></tr>
</table>

<table>
<tr><td>Module Code</td><td>CE3162</td><td>Module Title</td><td colspan="4">Fundamentals of Transportation Engineering</td></tr>
<tr><td>Credits</td><td>2</td><td rowspan="2">Hours/Week</td><td>Lectures</td><td>1.5</td><td rowspan="2">Pre – requisites</td><td rowspan="2">None</td></tr>
<tr><td>GPA/NGPA</td><td>GPA</td><td>Lab/Assignments</td><td>3/2</td></tr>
<tr><td colspan="7"><u>Learning Outcomes</u>
Ability to apply basic traffic flow theory to describe traffic flow conditions and recognize the appropriateness of traffic management measures that are in use;
Ability to describe transport planning process, identify its importance and calculate traffic demand based on given information; and
Ability to identify basic elements in highway planning and recognize the importance of accident risk reduction and relate environmental considerations.</td></tr>
<tr><td colspan="7"><u>Outline Syllabus</u>
Introduction: Transport systems, impacts, desired features, role of transport professionals
Transport Function: Need for transport, Accessibility & mobility, different transport modes
Traffic Flow Theory: Speed, flow & density measurements, data handling, analysis & interpretation
Fundamentals of Transport Planning: Planning processes, trip generation & attraction, Trip distribution, model split, trip assignment
Safety Considerations: Concept of safety and risk, safety management, driver behaviour and human factors, human error, punishments, risk mitigation
Environmental Considerations: Transport related activities that affect the environment, identification of possible impacts
Transport Infrastructure Requirements: Process of development, basic elements of highway planning, low volume roads, new transport infrastructure developments
Fundamentals of Transportation Systems Management</td></tr>
</table>

<table>
<tr><td>Module Code</td><td>CE3992</td><td>Module Title</td><td colspan="3">Industrial Training</td></tr>
<tr><td>Credits</td><td>6.0</td><td rowspan="2">Duration</td><td rowspan="2">24 weeks</td><td rowspan="2">Pre – requisites</td><td rowspan="2"></td></tr>
<tr><td>GPA/NGPA</td><td>NGPA</td></tr>
<tr><td colspan="6"><u>Learning Outcomes</u>

• Understanding the ways of industry and developing talent and attitude so that he/she can enjoy fully, a career in engineering while recognizing his/her responsibilities as a professional engineer in the future.
• Understanding real life situations in the industrial organizations and their related environments and accelerating the learning process of how his/her knowledge could be used in a realistic way.
• Practising to execute more informed judgment and learn associated responsibilities.
• Experiencing that financial and economic limitations play a more important role in all engineering activities.
• Understanding the formal and informal relationships in an industrial organization so as to promote favourable human relations and team work.
• Appreciating that engineering is an expanding field and that learning has no limitations.
• Understanding that the problems encountered in the industry rarely have unique solutions and gaining experience to select the optimal solution from the many alternatives available.
• Experiencing the industry safety practices, requirements and appropriateness.
• Developing a sense of responsibility towards society in general.</td></tr>
<tr><td colspan="6"><u>Outline Syllabus</u>

<u>Sector: Consulting / Client Organizations</u>; Study of Contract / Tender Documents; Preparation of Technical Documentation; Tender Procedures and Evaluation; Study of Work Site Procedures; Surveying, Levelling and Setting out; Study of Construction Materials; Study of Construction Equipment; Study of Building Services and Finishes; Construction of Structures; Assist in Construction Supervision;

<u>Sector: Contracting Organizations</u>; Study of Work Site Procedures; Surveying, Levelling and Setting out; Study of Construction Materials; Study of Construction Equipments; Study of Building Services and Finishes; Assist in Interim Valuations; Assist in Sub – Contractors' Payments; Assist in Claims for Variations; Construction of Structures; Assist in Construction Supervision</td></tr>
</table>

<table>
<tr><td>Module Code</td><td>CE3912</td><td>Module Title</td><td colspan="4">Survey Camp</td></tr>
<tr><td>Credits</td><td>2.5</td><td rowspan="2">Hours/Week</td><td>Lectures</td><td>-</td><td rowspan="2">Pre – requisites</td><td rowspan="2">CE2142</td></tr>
<tr><td>GPA/NGPA</td><td>NGPA</td><td>Lab/Assignments</td><td>112.5</td></tr>
<tr><td colspan="7">Learning Outcomes

• Ability to use different survey methods and equipment for surveying and civil engineering applications;
• Ability to prepare survey drawings and do associated computations; and
• Ability to carry out setting out work for civil engineering construction works.</td></tr>
<tr><td colspan="7"><u>Outline Syllabus</u>

• Residential camp for field work and drawing office work, to include from among the following:
o Theodolite traversing, adjustment computations, and plotting survey plan.
o Levelling and plotting Longitudinal and Cross-Sections
o Contouring and preparing the contour map.
o Traversing with Total Station.
o Triangulation using Total Station and high accuracy theodolite.
o Surveying with Global Positioning System.
o Setting out work (building/ curves).
o Field Astronomy observations and explanations.
o Demonstration/ use of related software.
o Use of precise level.</td></tr>
</table>

<table>
<tr><td>Module Code</td><td>CE4012</td><td>Module Title</td><td colspan="4">Design of Concrete Structures II</td></tr>
<tr><td>Credits</td><td>3</td><td rowspan="2">Hours/Week</td><td>Lectures</td><td>2</td><td rowspan="2">Pre – requisites</td><td rowspan="2">CE2122</td></tr>
<tr><td>GPA/NGPA</td><td>GPA</td><td>Lab/Assignments</td><td>3</td></tr>
<tr><td colspan="7"><u>Learning Outcomes</u>

• Ability to design statically determinate pre-stressed concrete beam elements; and
• Ability to design rectangular overhead/ground water tanks.</td></tr>
<tr><td colspan="7"><u>Outline Syllabus</u>

• Pre-stressed concrete structures: Basic principles and methods of pre-stressing; Materials for pre-stressing; pre-stress loss; Design of flexural members for serviceability and ultimate limit states.
• Water retaining concrete structures: Introduction to code of practice; Basis of design and materials, Design aspects of reinforced concrete water retaining structures – calculation of crack widths due to external loads, calculation of crack widths in relation to thermal and moisture effects, Joints in water retaining structures, Design examples.</td></tr>
</table>

Module Code	CE4022	**Module Title**	Hydraulic Design			
Credits	3	**Hours/Week**	**Lectures**	2	**Pre – requisites**	CE3012
GPA/NGPA	GPA		**Lab/Assignments**	3		

Learning Outcomes

- Ability to design an earthen open channel to convey water;
- Ability to delineate a watershed and develop the design hydrograph for the determination of structure parameters;
- Ability to carryout a reservoir operation and to carryout Flood Routing through a reservoir or through a river section;
- Ability to design an energy dissipater; and
- Ability to identify hydraulic structures and their components according to their purpose.

Outline Syllabus

- Introduction to Hydraulic Design: Importance of Hydraulic Design, Type of structures: Conveyance, Regulation, Measurement and Safety. Chutes, Flumes, Drops, Regulators. Use and Need of hydraulic structures. Layouts: Inlets, Controls, Transfer Sections, Transitions: Incorporation of environmental needs, Earthen Canal Design, Roughness Coefficients, Full Supply Depth and Free Board.
- Hydrologic Design for Structures: Catchment delineation and extraction of parameters for hydrologic design, Return Period, Design Life, Design Flood, Design Level, Risk Analysis, Hydro Economic Analysis, Synthetic Unit Hydrograph, Design Rainfall, Design Inflow Hydrograph
- Hydraulic Design of Structures: Design for seepage pressures, Concept of cut-off walls, Design of Retention and Detention Reservoirs, Design Capacity of Reservoirs, Mass Curve and Residual Mass Curve, Flood Routing, Reservoir Routing and Channel Routing. Hydrodynamic Modelling.
- Field Visit: Field inspection of Hydraulic Structure Construction aspects, functioning, study of problems and other considerations in hydraulic design.

Module Code	CE4032	**Module Title**	Geotechnical Design			
Credits	3.0	**Hours/Week**	**Lectures**	2.5	**Pre – requisites**	CE3132
GPA/NGPA	GPA		**Lab/Assignments**	3/2		

Learning Outcomes

- Ability to design appropriate retaining walls for a given situation;
- Ability to design shallow foundations for a given structure and soil conditions; and
- Ability to design piles and pile groups to support structures for given soil conditions.

Outline Syllabus

- **Earth Retaining Structures:**
  Different types of earth retaining structures, Evaluation of earth pressures by Rankine's theory and by Coulomb's trial wedge approach, Effect of wall roughness, effects of pore water pressure and seepage, codes for the design of earth retaining structures, Design of gravity retaining walls to resist different failure modes, Design of embedded retaining walls by free earth support method and fixed earth support method.

- **Shallow Foundations:**

  Design of centrally and eccentrically loaded footings with vertical and inclined loads; Use of in-situ soil test results in shallow foundation design; Settlement estimation of shallow foundations using the theory of beams on elastic medium.

- **Deep Foundations:**
  Construction quality controlling and quality assurance of deep foundations; Design of vertically loaded single pile; Design of pile groups subjected to vertical loads.

<table>
<tr><td>Module Code</td><td>CE4042</td><td>Module Title</td><td colspan="4">Highway Engineering</td></tr>
<tr><td>Credits</td><td>3.0</td><td rowspan="2">Hours/Week</td><td>Lectures</td><td>2.5</td><td rowspan="2">Pre – requisites</td><td rowspan="2">CE3162</td></tr>
<tr><td>GPA/NGPA</td><td>GPA</td><td>Lab/Assignments</td><td>3/2</td></tr>
<tr><td colspan="7"><u>Learning Outcomes</u>

• Ability to design highway elements for a two-lane road segment</td></tr>
<tr><td colspan="7"><u>Outline Syllabus</u>

• Geometric Design: Highway functional classification, principle of highway location, factors influencing highway design, sight distance, design of alignment, horizontal & vertical curves, cross sections, super elevation, pedestrian & bicycle facilities, use of Geometric design codes and guidelines, and introduction to geometric design software.

• Capacity Design: Highway capacity, design of two-lane roads, service flow rate, volume/capacity ratio, level of service.

• Pavement Analysis and Mechanistic Design: Types of pavements, structural components of flexible pavements, estimation of design loads, Stresses and strains in pavement, introduction of design guidelines, asphalt pavement design, rigid pavement design, drainage design and drainage structures.

• Highway Materials: Properties of soils, aggregate, and bitumen used in highway construction, Standard specifications and test methods for road construction materials, quality control and acceptance criteria</td></tr>
</table>

<table>
<tr><td>Module Code</td><td>CE4052</td><td>Module Title</td><td colspan="4">Environmental Engineering</td></tr>
<tr><td>Credits</td><td>3</td><td rowspan="2">Hours/Week</td><td>Lectures</td><td>2.5</td><td rowspan="2">Pre – requisites</td><td rowspan="2">CE3152</td></tr>
<tr><td>GPA/NGPA</td><td>GPA</td><td>Lab/Assignments</td><td>3/2</td></tr>
<tr><td colspan="7"><u>Learning Outcomes</u>

• Ability to carry out water quality assessments for different uses and need for compliance;
• Ability to plan and design water supply and wastewater collection systems; and
• Ability to select processes for water and wastewater treatment and water pollution control and carry out their conceptual design.</td></tr>
<tr><td colspan="7"><u>Outline Syllabus</u>

• Water Supply: Engineering decisions in planning of water supply scheme, design principles for water supply schemes – Intake, Pumps, Transmission Mains, Service Reservoirs, Distribution Systems.
• Water Treatment Principles: Introduction to conventional water treatment – Aeration, Plain Sedimentation, Coagulation & Flocculation, Filtration, Disinfection, Stabilization
• Wastewater Collection: Sewerage systems, Layouts, Sewer Appurtenances & Design Concepts, Sewer Hydraulics, Estimation of Wastewater and Storm water flows, Design of Sewerage.
• Wastewater Treatment Principles: Introduction to biological treatment and physico-chemical treatment of wastewater, Design of Septic Tanks.</td></tr>
</table>

<table>
<tr><td>Module Code</td><td>CE4902</td><td>Module Title</td><td colspan="4">Communication Skills for Projects</td></tr>
<tr><td>Credits</td><td>2</td><td rowspan="2">Hours/Week</td><td>Lectures</td><td>1</td><td rowspan="2">Pre – requisites</td><td rowspan="2">EL1022</td></tr>
<tr><td>GPA/NGPA</td><td>NGPA</td><td>Lab/Assignments</td><td>3</td></tr>
<tr><td colspan="7"><u>Learning Outcomes</u>

• Ability to communicate effectively in verbal and written mode, with specific applications to projects in the final year
.</td></tr>
<tr><td colspan="7"><u>Outline Syllabus</u>

Writing Skills
1. Project Proposals
2. Literature Reviews
3. Project Reports
4. Research Papers
5. Minutes, Memos, Emails and Letters

Verbal Skills
6. Presentation Techniques
7. Participation at meetings, Telephone conversations</td></tr>
</table>

<table>
<tr><td>Module Code</td><td>CE4312</td><td>Module Title</td><td colspan="4">Building Engineering</td></tr>
<tr><td>Credits</td><td>3.0</td><td rowspan="2">Hours/Week</td><td>Lectures</td><td>2</td><td rowspan="2">Pre – requisites</td><td rowspan="2">CE1132</td></tr>
<tr><td>GPA/NGPA</td><td>GPA</td><td>Lab/Assignments</td><td>3</td></tr>
<tr><td colspan="7"><u>Learning Outcomes</u>

• An appreciation of building services and formwork, and the way they impinge on structural design</td></tr>
<tr><td colspan="7"><u>Outline Syllabus</u>

Design of water supply, above ground and below ground waste disposal systems; vertical and horizontal circulation; electricity supply; air conditioning; integration of services for low, medium and high – rise buildings.
Design of formwork, false work and cladding systems
Preparation of general arrangement and detail drawings using AUTOCAD</td></tr>
</table>

Module Code	CE4322	**Module Title**	Irrigation Engineering			
Credits	3.0	**Hours/Week**	**Lectures**	3.0	**Pre – requisites**	CE3012
GPA/NGPA	GPA		**Lab/Assignments**	-		

Learning Outcomes

- Ability to identify important physical properties and water management techniques and practices for irrigation system design, planning and operation
- Ability to propose an irrigation canal layout and the associated major structures to supply water in gravity fed systems.
- Ability to carryout a feasibility study for an irrigation system using time value of money.

Outline Syllabus

Irrigation principles – Soil-plant-water relationship, soil moisture storage, reservoir analogy, evaluation of water available to the plant, Field capacity, Permanent wilting point, Root zone, Infiltration –introduction and measurements.

Evaluation of Irrigation Requirement – Evapotranspiration, reference crop evapotranspiration, crop growth stages, crop coefficient, crop evapotranspiration, effective rainfall, efficiency concepts in water use, field irrigation requirement.

Irrigation Practices – Common Irrigation practices, Surface irrigation, wetting pattern, basin, border and furrow irrigation, Sub-irrigation, Overhead irrigation, Drop irrigation, Lift irrigation.

Planning and Design of irrigation systems - Availability of land and water resources, soil surveys, climatological survey related to crop water use, site investigations, command area, canal layout considerations and major irrigation structures for planning and design.

Irrigation System Management –Irrigation Reservoir, Operation, Reservoir operation schedules, Reservoir operation and management options, Estimation of Reservoir yield,

Irrigation in Sri Lanka – Climate and rainfall patterns in Sri Lanka, Types of irrigation systems, Types of water sources, Introduction to Mahaweli Programme, Tank irrigation, Rice cultivation, Design and rehabilitation of irrigation systems.

Irrigation Water Management – Objectives of water management, methods of distributing irrigation water, preparation of irrigation schedules, advantage and disadvantage of each method, water management design guidelines

Feasibility Analysis - Financial, economic and environmental feasibility of irrigation projects, Interest calculations, Cash-flow diagrams, discount factors and discounting techniques.

<table>
<tr><td>Module Code</td><td>CE4332</td><td>Module Title</td><td colspan="4">Remote Sensing and GIS</td></tr>
<tr><td>Credits</td><td>3.0</td><td rowspan="2">Hours/Week</td><td>Lectures</td><td>2.5</td><td rowspan="2">Pre – requisites</td><td rowspan="2">CE2142</td></tr>
<tr><td>GPA/NGPA</td><td>GPA</td><td>Lab/Assignments</td><td>3/2</td></tr>
<tr><td colspan="7"><u>Learning Outcomes</u>

• Ability to interpret aerial photographs and estimate heights.
• Ability to interpret remote sensing data visually and digitally.
• Ability to use a Geographic Information System (GIS) for data analysis and presentation.</td></tr>
<tr><td colspan="7"><u>Outline Syllabus</u>

Aerial photogrammetry and applications:
Introduction to aerial photogrammetrv, flight planning. geometry of photographs and distortions. stereo-photogramnietry and heighting; Analogue and analytical methods of plotting from aerial photographs; Air photo interpretation.

Introduction to remote sensing:
Spectral reflectance curves of earth objects. Electromagnetic energy transfer through atmosphere and digital data acquisition; earth observation satellite systems and energy bands: analysis of digital data; effective combination of energy bands for different purposes: production of colour composites: interpretation of satellite images.

GIS techniques:
Introduction to GIS, vector and raster features, relationship between features and attribute data, introduction to development of feature maps, use of GIS software in data analysis and presentation.</td></tr>
</table>

Module Code	CE4342	**Module Title**	Construction Technology			
Credits	3.0	**Hours/Week**	**Lectures**	2.0	**Pre – requisites**	CE1132
GPA/NGPA	GPA		**Lab/Assignments**	3.0		

Learning Outcomes

- Ability to plan appropriate construction equipment and methods for Civil Engineering construction.
- Skills for setting out of construction work and of computer tools for management of large construction work.
- Ability to carryout construction activity at site as a Junior Engineer in a construction site.

Outline Syllabus

Classification and use of Construction equipment for Civil Engineering work such as dams, road work, bridge construction.

Setting out of buildings and major Civil Engineering work, temporary works and formwork systems, new systems for building construction.

Deep excavation and earth works including de-watering and methods of ground water control
Construction of deep foundations with Piles.

Advanced construction methods and new materials for bridge construction, road construction.
Tunneling, drilling and rock blasting.

Pipe-laying and drainage work.

Aggregate production, Mixing, transporting and placing of concrete.

Application of quality processes and ISO 9000 for heavy construction work.

Application of computer tools for management of heavy construction work.

<table>
<tr><td>Module Code</td><td>CE4352</td><td>Module Title</td><td colspan="4">Traffic Engineering and Planning</td></tr>
<tr><td>Credits</td><td>3.0</td><td rowspan="2">Hours/Week</td><td>Lectures</td><td>2.5</td><td rowspan="2">Pre – requisites</td><td rowspan="2">CE3162</td></tr>
<tr><td>GPA/NGPA</td><td>GPA</td><td>Lab/Assignments</td><td>3/2</td></tr>
<tr><td colspan="7"><u>Learning Outcomes</u>

• Ability to chose and design an appropriate intersection control mechanism based on traffic flow and geometric conditions.
• Ability to carry out a basic traffic impact assessment.
• Ability to identify accident risk and propose suitable remedial measures.</td></tr>
<tr><td colspan="7"><u>Outline Syllabus</u>

Traffic Flow Models: Basic car following models, different traffic flow models.
Traffic Flow Analysis: Use of traffic flow models, one-way roads, lane reversal, bus only lanes.
Transport Surveys: Household surveys, road side interviews, O-D surveys.
Transport Demand Estimation: Trip generation, trip distribution, modal split and trip assignment models, introduction to demand modelling software.
Road safety & accident analysis: Accident data collection and analysis, accident investigations, conflict studies, road safety audits.
Traffic Impact Assessments (TIA).
Unsignalized Intersection: Types of control & selection criterion.
Interchanges: Overpasses Vs Underpasses, Different ramp arrangements, Basic interchange types. Roundabouts & traffic circles: Capacity, weaving sections.
Traffic Signals: Signal technology, warrants for traffic signals, phasing arrangements, signal timing calculations, pedestrian signals.
Delay Studies: Shock wave theory, incident analysis.</td></tr>
</table>

<table>
<tr><td>Module Code</td><td>CE4112</td><td>Module Title</td><td colspan="4">Management Skill Development</td></tr>
<tr><td>Credits</td><td>2.0</td><td rowspan="2">Hours/Week</td><td>Lectures</td><td>4.0*</td><td rowspan="2">Pre – requisites</td><td rowspan="2">CE3142</td></tr>
<tr><td>GPA/NGPA</td><td>GPA</td><td>Lab/Assignments</td><td>-</td></tr>
<tr><td colspan="7"><u>Learning Outcomes</u>

• Ability to understand and interpret key accounting documents and related those to construction activities;
• Ability to organize and manage a small work force; and
• Ability to recruit and manage human resource in a small contractor organization.</td></tr>
<tr><td colspan="7"><u>Outline Syllabus</u>

• Foundation for organization and management: Basic human behavior (personal skills) and group behavior(interpersonal skills); Power and leadership(group skills); communication and motivation; individual and organizational effectiveness; decision making and planning function: Organizing staffing; directing and controlling.
• Financial Statements: Accounting principles and concepts, financial statements and its applicability to construction industry.
• Labour management and related law: industrial disputes, Trade unions, EPF, ETF, gratuity and other related acts, work place health, safety and welfare, Business ethics.</td></tr>
</table>

* Conducted during a term

Module Code	CE4912	**Module Title**	Comprehensive Design Project			
Credits	5.0	**Hours/Week**	**Lectures**		**Pre – requisites**	
GPA/NGPA	GPA		**Lab/Assignments**			

Learning Outcomes

- Acquire knowledge and develop necessary skills to undertake design projects, work in a team and complete the design phase to the satisfaction of all the stake holders involved.

Outline Syllabus

Identification of objectives, requirements and nature of the project; Formulation of design alternative and analysis of feasibility of these alternatives considering environmental, social, economic and financial aspects; Planning of design phase and preparation of work breakdown structure (WBS); Project organization and team building; Geotechnical site investigation; Preliminary design, Detail design including, verification and validation of the design output; Management of stakeholders; Preparation of tender documents; Other work associated with procurement / implementation of the project and complete of detailed drawings.

Module Code	CE4922	**Module Title**	Research Project			
Credits	4.0	**Hours/Week**	**Lectures**		**Pre – requisites**	
GPA/NGPA	GPA		**Lab/Assignments**			

Learning Outcomes

- Ability to understand the process of scientific research, techniques and rationalisation
- Ability to plan and organise a research project incorporating key components and reasonable timelines
- Ability to carryout a research project by intelligently analyzing a practical problem and to conclude in a scientific and logical manner.

Outline Syllabus

Problem Identification and Project Formulation - Formation of Groups, Group Compositions, Identification of Problem Statement, Overall Objectives, Specific Objectives, Individual objectives, Contribution to the Society, Scope of Work, Outputs and Outcomes, Resource Requirements

Research Methods – Data Collection and Checking Methods and Needs, Analysis Methods, Parameter Identification, Calibration and Verification, Field Surveys, Literature Surveys, Laboratory Experiments, Statistical Techniques, Use of Software

Research Project Planning - Preparation of Work Plans, Progress Monitoring, Assessment Techniques, Timing of Field Data Collection and other Programs,

Research Report Preparation and Defence - Reporting Formats, Referencing Methods, Arrangement Contents page and Sub Sections, Formatting of Text, Graphs, Tables and Figures, Available Tools, Organisation of a Presentation, Presentation Techniques, Expressing and Delivery of Outputs.

Module Code	CE4123	**Module Title**	Engineering Economics			
Credits	2.0	**Hours/Week**	**Lectures**	2.0	**Pre – requisites**	MN3042
GPA/NGPA	GPA		**Lab/Assignments**	-		

Learning Outcomes

- Ability to select the best course of action for an engineering problem, by comparing a range of alternative actions based on their costs, benefits and returns; and
- Ability to read financial statements and use those to evaluate a company's operating performance, financial position, and cash flows

Outline Syllabus

- Fundamentals: Time value of money, equivalence, cash flow diagrams.
- Discounted Cash Flow: Time value equivalence, single payment and annuity factors, numerical examples, cash flows and compounding.
- Comparison Methods: Assumptions, net present value, annual worth, equivalent annual cost with/without salvage value, equivalent annual worth of fixed asset lives and perpetual lives, internal rate of return (IRR), minimum acceptable rate of return, benefit cost (B/C) analysis, IRR and B/C irregularities, numerical examples.
- Analysis of Alternatives: Classification, mutually exclusive alternatives, incremental analysis, preferred method for decision-making.
- Financial Statements Analysis: using operational research and other relevant methods, ratios to make business decisions.
- Project Feasibility Analysis: Financial feasibility, market price analysis, cost of capital and weighted average, shadow pricing,, economic feasibility, preferred method for decision making.
- Sensitivity Analysis and Risk Management: What if sensitivity graph and interpretation of the analysis, risk identification, risk analysis, risk response.

<table>
<tr><td>Module Code</td><td>CE4412</td><td>Module Title</td><td colspan="4">Bridge Engineering</td></tr>
<tr><td>Credits</td><td>3.0</td><td rowspan="2">Hours/Week</td><td>Lectures</td><td>2</td><td rowspan="2">Pre – requisites</td><td rowspan="2">CE3112</td></tr>
<tr><td>GPA/NGPA</td><td>GPA</td><td>Lab/Assignments</td><td>3</td></tr>
<tr><td colspan="7"><u>Learning Outcomes</u>

• Ability to analyse and design bridges in masonry, steel and pre stressed structural concrete</td></tr>
<tr><td colspan="7"><u>Outline Syllabus</u>

Classification of bridges;

Bridge loading;

Investigation for bridges;

Analysis and design of: pre-stressed concrete bridges, steel bridges, composite bridges, Suspension bridges.

Introduction to cable stayed and box girder bridges;

Design of substructure and foundations;

Maintenance of bridges;

Construction techniques of bridges</td></tr>
</table>

<table>
<tr><td>Module Code</td><td>CE4422</td><td>Module Title</td><td colspan="4">Advanced Structural Engineering and Design</td></tr>
<tr><td>Credits</td><td>3.0</td><td rowspan="2">Hours/Week</td><td>Lectures</td><td>2</td><td rowspan="2">Pre – requisites</td><td rowspan="2">CE3112</td></tr>
<tr><td>GPA/NGPA</td><td>GPA</td><td>Lab/Assignments</td><td>3</td></tr>
<tr><td colspan="7"><u>Learning Outcomes</u>
• Ability to analyze and design complete complex structures</td></tr>
<tr><td colspan="7"><u>Outline Syllabus</u>
• Plastic analysis; Design of steel portal frames
• Yield line analysis; design irregular slabs in reinforced concrete
• Theory of shells; design of Intze type water tanks
• Beams on elastic foundations; design of flexible foundations and laterally loaded piles
• Deep beams and shear walls; applications in tall buildings</td></tr>
</table>

<table>
<tr><td>Module Code</td><td>CE4432</td><td>Module Title</td><td colspan="4">Design of Large Structures</td></tr>
<tr><td>Credits</td><td>3.0</td><td rowspan="2">Hours/Week</td><td>Lectures</td><td>2.5</td><td rowspan="2">Pre – requisites</td><td rowspan="2">CE3112</td></tr>
<tr><td>GPA/NGPA</td><td>GPA</td><td>Lab/Assignments</td><td>3/2</td></tr>
<tr><td colspan="7"><u>Learning Outcomes</u>

• Ability to design large structures such as tall buildings, transmission towers, dams and shell structures by using finite element software and associated design techniques
• Enhance the confidence to engage in large projects</td></tr>
<tr><td colspan="7"><u>Outline Syllabus</u>

• Techniques for the analysis and design of tall buildings (30 storey and above) with three-dimensional finite element modeling and the methods to deal with the dynamic forces and effects.

• Techniques for analysis and design of large truss or frame structures such as transmission towers with advanced computer modeling.

• The use of plane stress, plate bending, thin shell, thick shell and solid elements to model, analyze and design large structures such as domes, box culverts, elevated water tanks, ground water reservoirs, etc.</td></tr>
</table>

<table>
<tr><td>Module Code</td><td>CE4442</td><td>Module Title</td><td colspan="4">Computational Mechanics</td></tr>
<tr><td>Credits</td><td>3.0</td><td rowspan="2">Hours/Week</td><td>Lectures</td><td>2</td><td rowspan="2">Pre – requisites</td><td rowspan="2">CE3112</td></tr>
<tr><td>GPA/NGPA</td><td>GPA</td><td>Lab/Assignments</td><td>3</td></tr>
<tr><td colspan="7"><u>Learning Outcomes</u>

• Ability to confidently model, calibrate and analyse any type of structures with finite elements for research purposes</td></tr>
<tr><td colspan="7"><u>Outline Syllabus</u>

• Introduction to computational mechanics
• Formulations of non-linear finite elements and assembled global stiffness matrix
• Shape functions & Equivalent loads
• Techniques to solve boundary value problems
• Integration schemes, convergence of solutions, compatibility and completeness
• Modelling material behaviour (including introduction to fracture mechanics)
• Applications above computational techniques</td></tr>
</table>

Module Code	CE4452	**Module Title**	Coastal and Port Engineering			
Credits	3.0	**Hours/Week**	**Lectures**	3.0	**Pre – requisites**	CE3012
GPA/NGPA	GPA		**Lab/Assignments**	-		

Learning Outcomes

- Acquire knowledge on the principles of Coastal Zone Management and application to Sri Lanka
- Acquire knowledge on the dynamic coastal environment and the associated hydraulic regimes
- Acquire knowledge on coast protection schemes and ability to select appropriate coast protection schemes for given hazard scenario
- Acquire knowledge on the planning and layout of harbours and the use of appropriate structures
- Ability to analyze impact of near shore processes, design rock armoured rubble mound structures and compute forces on piled vertical structures

Outline Syllabus

Coastal Zone Management in Sri Lanka: Development of CZM in Sri Lanka, Coastal Hazards and Vulnerability, Environmental Problems and their management, Environmental impact assessment for development projects.

Coastal Environment: Introduction to the dynamic coastal environment, Tides, Wave generation by wind, Random waves, Probabilistic description of ocean waves, Wave propagation and forecasting, Wave measurements

Coastal Hydraulics: Deterministic wave theories, Small amplitude wave theory, Near-shore processes

Coastal Processes and Coastal Protection: Sediment transport, Beaches, Coastal erosion, Coast Protection Systems, Artificial, natural and hybrid methods, Case histories

Port and Harbour Engineering: Planning and Design of Fishery harbors and Commercial Ports

Coastal and Harbour Structures: Classification, Important aspects of wave-structure interaction, Rock and concrete armoured breakwaters, Design of Rock armoured rubble mound breakwaters. Experimental investigations to support the design process. Wave forces on cylindrical piles and vertical walls.

Module Code	CE4462	**Module Title**	Disaster Risk Management and Mitigation			
Credits	3.0	**Hours/Week**	**Lectures**	3.0	**Pre – requisites**	None
GPA/NGPA	GPA		**Lab/Assignments**	-		

Learning Outcomes

- Acquire a knowledge base on principles of disaster risk management and mitigation via components of hazards, vulnerability, capacity and risk assessment.
- Acquire an understanding on the national initiatives on Disaster Management
- Ability to assess the impacts arising from meteorological, hydrological, geo/seismic and coastal hazards.
- Ability to identify critical design aspects through the lessons from failures and disasters.
- Ability to develop strategic planning and mitigation for disaster risk reduction.

Outline Syllabus

Principles of Risk and Disaster Management:
Introduction to Disaster Management, Components of Risk and its Assessment: Hazards, Vulnerability and Capacity, Risk Assessment, Disaster Preparedness, Early Warning Emergency Planning and Management, Response and Standard Operations Procedures, Administrative, Social and Cultural aspects of Disaster Management

National Approach towards Disaster Management:
Disaster Management Act and its implementation, National initiatives on Disaster Management, Preparedness, Community Based Disaster Management, Disaster Risk Assessment

Hazards, Risk Assessment and Mitigation:
Analysis of Hazards: Causes, Occurrence, Forecasting, Early Warning, Preparedness and Mitigation, Case Studies on Risk Assessment

Design against Disasters:
Lessons from disasters: Extreme loading, failure patterns, strength and durability, understanding how structures behave through Case Studies on investigations of disasters and their impacts. Design against failure: The development of guidelines on good practice and codes of practice.

Strategic Planning and Mitigation:
Strategic Mitigation and Disaster Risk Reduction, Application of GIS and Remote Sensing in Disaster Management, Urban Planning using Hazard, Vulnerability and Risk Maps/Evacuation Maps

Module Code	CE4472	**Module Title**	Environmental Geotechnics			
Credits	3.0	**Hours/Week**	**Lectures**	2.0	**Pre – requisites**	CE3132
GPA/NGPA	GPA		**Lab/Assignments**	3.0		

Learning Outcomes

- Ability to design sanitary landfills and remediation of polluted sites

Outline Syllabus

Soil-water pollutant interaction
Contaminant transport through saturated and unsaturated soils

Laboratory and insitu measurement of hydraulic conductivity
Remedial measures for polluted sites

Lechate and gas generation

Use of geosynthetics and geosynthetic clay liners

Design of sanitary landfills

Sri Lankan guidelines for the establishment of waste disposal sites

Module Code	CE4482	**Module Title**	Computational Geotechnical Engineering			
Credits	3.0	**Hours/Week**	**Lectures**	2.0	**Pre – requisites**	CE3132
GPA/NGPA	GPA		**Lab/Assignments**	3.0		

Learning Outcomes

- Ability to explain basic formulation of the finite element method, stress and strain analysis, and constitutive relations
- Ability to numerically simulate earth slope stability problems, seepage in soils, earth retaining structures and foundations in soil using computer software
- Ability to interpret computer generated results in the proper context of geotechnical engineering
- Ability to interpret high strain load testing and low strain integrity testing of piles.

Outline Syllabus

Boundary value problems and Indicial notation.
The finite element method under small displacement and infinitesimal strain theory.
Stress and strain analysis in continuous media.
Constitutive relations for geo-materials.
Geotechnical Instrumentation and monitoring.
High strain dynamic load testing, and low strain integrity testing of pile foundations.
Geotechnical databases.
Seepage study (Computational analysis of seepage in soils by finite element software).
Design of earth retaining system (Computational analysis of earth retaining walls by finite element and limit equilibrium software).
Earth slope design (Computational analysis of slope stability by finite element and limit equilibrium software).
Deformation analysis of foundations (Computational analysis of foundation-soil interaction by finite element software).

<table>
<tr><td>Module Code</td><td>CE4492</td><td>Module Title</td><td colspan="4">Project Management</td></tr>
<tr><td>Credits</td><td>3.0</td><td rowspan="2">Hours/Week</td><td>Lectures</td><td>2.0</td><td rowspan="2">Pre – requisites</td><td rowspan="2">CE3142</td></tr>
<tr><td>GPA/NGPA</td><td>GPA</td><td>Lab/Assignments</td><td>3.0</td></tr>
<tr><td colspan="7"><u>Learning Outcomes</u>

• Ability to plan and execute a project using project management tools and techniques.
• Ability produce project progress reports.
• Ability to use of leading project management software MS Project, MS Project Sever and Primavera.</td></tr>
<tr><td colspan="7"><u>Outline Syllabus</u>

Project Initiation – Introduction to project management, Project management framework and project management framework.

Project Management knowledge areas – Integration management, Project scope, Time management, Cost management, Quality management, Human resource management, Communication management, Risk management, Procurement management and Code of Professional conduct.

Project Management computer based tools and techniques – MS Project, MS Project Sever and Primavera

New project management techniques such as Agile Project Management</td></tr>
</table>

<table>
<tr><td>Module Code</td><td>CE4502</td><td>Module Title</td><td colspan="4">Management Information Systems</td></tr>
<tr><td>Credits</td><td>3.0</td><td rowspan="2">Hours/Week</td><td>Lectures</td><td>2.0</td><td rowspan="2">Pre – requisites</td><td rowspan="2">MN3042</td></tr>
<tr><td>GPA/NGPA</td><td>GPA</td><td>Lab/Assignments</td><td>3.0</td></tr>
<tr><td colspan="7"><u>Learning Outcomes</u>

• Ability to learn and use commercial management information systems.
• Ability to develop and use of small scale management information systems especially related construction organizations.
• Ability to relate Management information systems for construction organizations.
• Skills to use asset management computer tools</td></tr>
<tr><td colspan="7"><u>Outline Syllabus</u>

Introduction to management information systems used by construction organizations: Case studies to be based on world leading management information systems such as SAP and specialised Enterprise management information systems for construction companies such as MS Project Server.
Development of Management information systems using MS Access or similar program: System Analysis, design, development and implementation.
Organizations, Management, and the Networked Enterprise: Digital organizations, E-Business, Information systems and organization strategy, Ethical and social issues related to information systems.
Information Technology and Infrastructure: IT infrastructure and emerging technologies, Databases and information systems, Telecommunications, the internet, security of information systems.
Key applications for the Digital Age: Operational excellence and customer intimacy, E-commerce, Digital marketplace, Managing knowledge, Enhancing decision making.
Application of asset management software</td></tr>
</table>

<table>
<tr><td>Module Code</td><td>CE4512</td><td>Module Title</td><td colspan="4">Facilities Management</td></tr>
<tr><td>Credits</td><td>3.0</td><td rowspan="2">Hours/Week</td><td>Lectures</td><td>2.0</td><td rowspan="2">Pre – requisites</td><td rowspan="2">CE2052</td></tr>
<tr><td>GPA/NGPA</td><td>GPA</td><td>Lab/Assignments</td><td>3.0</td></tr>
<tr><td colspan="7"><u>Learning Outcomes</u>

• Ability to manage complex building services project.
• Ability to facilitate to manage client demands related to property management using tools and techniques such as life cycle cost analysis.
• Skills to optimize the management of resources in the context of facilities management.</td></tr>
<tr><td colspan="7"><u>Outline Syllabus</u>

System analysis and design: analysis of client and formation of strategic plans.

Human resource management: leadership, decision making, delegation, responsibility and motivation, management by objectives.

Quality management of standard building services projects, risk analysis, quality control, communication and feedback mechanisms.

Facilities management, concept of value, life cycle cost analysis, evaluation and costing in relation to functional requirements.

Maintenance management, executing, monitoring, planned preventive measures, breakdown maintenance, direct labour versus contract labour.

Application of asset management software.</td></tr>
</table>

<table>
<tr><td>Module Code</td><td>CE4522</td><td>Module Title</td><td colspan="4">Sustainable Design and Construction</td></tr>
<tr><td>Credits</td><td>3.0</td><td rowspan="2">Hours/Week</td><td>Lectures</td><td>2.0</td><td rowspan="2">Pre – requisites</td><td rowspan="2">CE1132</td></tr>
<tr><td>GPA/NGPA</td><td>GPA</td><td>Lab/Assignments</td><td>3.0</td></tr>
<tr><td colspan="7"><u>Learning Outcomes</u>

• Ability to incorporate renewable energy and sustainability aspects appropriately in to building construction, operation & maintenance processes
• Skills to use sustainable construction materials and methods in design and construction processes.
• Skills to work and use sustainable construction methods with design team different professionals.</td></tr>
<tr><td colspan="7"><u>Outline Syllabus</u>

Principles of Green Buildings, Neighbourhood design considerations,
Life cycle approach to select building materials
Sustainable methods of construction techniques
Thermal comfort, Indoor air quality
Natural and artificial ventilation designs for buildings with window design
Energy efficiency and the built environment,
The current trends in renewable energy sources and Applications
Maximizing the Use of Daylight,
Rain water Harvesting,
Solid Waste Disposal, Incinerators, Compost Yards
Sustainable building certification protocols (e.g.: LEED and BREEAM)</td></tr>
</table>

Module Code	CE4532	**Module Title**	Highway Construction and Maintenance Management			
Credits	3.0	**Hours/Week**	**Lectures**	2.5	**Pre – requisites**	CE3162
GPA/NGPA	GPA		**Lab/Assignments**	3/2		

Learning Outcomes

- Ability to select quality of material and appropriate method
- Ability to identify equipment and quality control requirement

Outline Syllabus

Construction Materials: Highway material properties and testing.

Asphalt Mix Design : Volumetric properties of asphalt (volume- Mass Diagram) Finding the optimum binder content using Marshall Mix design.

Construction methods: preparation of subgrade, embankments, earthwork in cutting and filling, grade and level control, compaction, subbases, use of natural materials, soil stabilization, bases, aggregate and bitumen bound base types, surfacing, asphalt concrete, surface dressing, rigid pavement construction, tests for quality assurance of construction, low cost construction methods, use of appropriate technology and locally available marginal materials, construction of drainage structures.

Highway Maintenance: Periodic and routine maintenance of roads. Failure identification and remedial measures, rehabilitation methods, asphalt concrete overlay, single and multiple surface dressing for periodic maintenance, sand seals, fog seals, and slurry seals, pot hole repair and sealing cracks, maintenance of road markings and road signs, maintenance of structures.

Site Management: Site management, safety at road works, cost control and cost record, maintenance of plant and equipment, standards for inspection of construction plant.

Road Asset Management: introduction to pavement management systems.

Module Code	CE4542	**Module Title**	Analysis and Design of Transportation Systems			
Credits	3.0	**Hours/Week**	**Lectures**	2.5	**Pre – requisites**	CE3162
GPA/NGPA	GPA		**Lab/Assignments**	3/2		

Learning Outcomes

.

- Ability to identify and formulate problems related to transportation systems planning and design
- Ability to identify appropriate tools for solving formulated problems mathematically

Outline Syllabus

Introduction to transportation systems: Context, concepts and characterization.

Highway networks: Connectivity and accessibility, Inventory data collection & routine, optimal paths; link independent, node independent alternate paths, traffic assignment models.
Urban transport systems: queuing models and delay analysis, traffic flow synchronization and coordination.

Feasibility Studies for transport Infrastructure: Selection of alternatives, pre- feasibility assessment, comparison of alternatives, project evaluations, concepts of disaster resilience.

Facility location problem: (e.g. fire and police stations, emergency medical services, emergency repair services etc) optimum routing mechanisms, Transport hubs, reliability analysis.

Railway networks: Optimum line length, scheduling for single & double track conditions. Mass transit systems: optimum network, terminal location and route arrangement, feeder systems

Pipeline systems: Function and types of Pipelines, Route Selection, Environmental Considerations.

Waterway transport systems: Types of waterways, lock and gate systems.

<table>
<tr><td>Module Code</td><td>CE4552</td><td>Module Title</td><td colspan="4">Water and Wastewater Treatment</td></tr>
<tr><td>Credits</td><td>3.0</td><td rowspan="2">Hours/Week</td><td>Lectures</td><td>2.5</td><td rowspan="2">Pre – requisites</td><td rowspan="2">CE3152</td></tr>
<tr><td>GPA/NGPA</td><td>GPA</td><td>Lab/Assignments</td><td>3/2</td></tr>
<tr><td colspan="7"><u>Learning Outcomes</u>

• Ability to select processes for water and wastewater treatment and carry out their conceptual design.
• Ability to do the process design and capacity calculations for each component</td></tr>
<tr><td colspan="7"><u>Outline Syllabus</u>

• Water treatment design

Design of conventional treatment process – aeration, coagulation, flocculation, sedimentation, clarification, filtration, floatation, disinfection.

• Wastewater treatment design

Preliminary treatment – screening, grit removal, odour control, flow equalization; primary treatment; Biological processes – attached growth and suspended growth processes, anaerobic processes and sludge treatment; land based and on-site treatment facilities.

• Advanced Treatment Technology

Suspended solids removal – granular media filtration, filtration & chlorination for virus removal, carbon adsorption; nutrient removal – biological and chemical phosphorous removal, biological nitrification, denitrification and ammonia stripping; Reduction of dissolved salts – distillation, reverse osmosis and electro dialysis</td></tr>
</table>

Module Code	CE4562	**Module Title**	Environmental Impact Assessment			
Credits	3.0	**Hours/Week**	**Lectures**	2	**Pre – requisites**	CE3152
GPA/NGPA	GPA		**Lab/Assignments**	3		

Learning Outcomes

- Ability to identify, assess and predict environmental impacts and propose appropriate mitigation
- Ability to work in an EIA team, prepare EIA Terms of Reference and conduct an EIA for a Civil Engineering Project

Outline Syllabus

- Development and environment
  Environmental issues related to development projects, pollution aspects.
- The EIA process
  EIA regulations, the EIA process in Sri Lanka, Project EIA and strategic EIA – EIA as a planning and management tool. Incorporation of remedial measures in to project documentation.
- Conducting EIA
  Terms of reference preparation, Baseline studies, Impact Identification and Quantification, EIA techniques and methodologies, Evaluation of alternatives impact mitigation.
- Introduction to environmental cost –benefit analysis
  Concept of valuation of environmental costs, Discounting rates, Internalization of environmental costs.

Service Courses offered by the Department of Civil Engineering

<table>
<tr><td>Module Code</td><td>CE1812</td><td>Module Title</td><td colspan="4">Mechanics of Materials</td></tr>
<tr><td>Credits</td><td>2.0</td><td rowspan="2">Hours/Week</td><td>Lectures</td><td>2.0</td><td rowspan="2">Pre – requisites</td><td rowspan="2">ME1012</td></tr>
<tr><td>GPA/NGPA</td><td>GPA</td><td>Lab/Assignments</td><td>-</td></tr>
<tr><td colspan="7"><u>Learning Outcomes</u>
• Ability to compute the stresses, strains and deformations due to applied forces in beams</td></tr>
<tr><td colspan="7"><u>Outline Syllabus</u>
• Bending stresses in beams
• Transverse shear stresses
• Analysis of stress and strain
• Deflection of beams</td></tr>
</table>

<table>
<tr><td>Module Code</td><td>CE1822</td><td>Module Title</td><td colspan="4">Aspects of Civil Engineering</td></tr>
<tr><td>Credits</td><td>2.0</td><td rowspan="2">Hours/Week</td><td>Lectures</td><td>2.0</td><td rowspan="2">Pre – requisites</td><td rowspan="2">None</td></tr>
<tr><td>GPA/NGPA</td><td>GPA</td><td>Lab/Assignments</td><td>-</td></tr>
<tr><td colspan="7"><u>Learning Outcomes</u>
Ability to understand the construction of a two storied house and supervise the quality and the cost effectiveness.
Ability to understand common building defects and their rectification methods.
Ability to understand the basic principles of land surveying</td></tr>
<tr><td colspan="7"><u>Outline Syllabus</u>
Introduction to common civil engineering structures.
Identification of building materials with respect to the quality, application and their cost.
Identification building elements and their construction procedure for a two storied house.
Introduction to building services including water, sanitary facilities, electricity, fire fighting, vertical circulation.
Introduction to common defects in buildings and their rectification methods
Introduction to ICTAD specifications
Introduction to surveying methods and surveying applications.
Setting out and vertical control for buildings</td></tr>
</table>

<table>
<tr><td>Module Code</td><td>CE2812</td><td>Module Title</td><td colspan="4">Soil Mechanics</td></tr>
<tr><td>Credits</td><td>3.0</td><td rowspan="2">Hours/Week</td><td>Lectures</td><td>2</td><td rowspan="2">Pre – requisites</td><td rowspan="2">None</td></tr>
<tr><td>GPA/NGPA</td><td>GPA</td><td>Lab/Assignments</td><td>3</td></tr>
<tr><td colspan="7"><u>Learning Outcomes</u>
• Ability to carry out basic soil classification and related tests.
• Ability to understand the effect of presence of water in soil with respect to stress and flow.
• Ability to understand the basic concepts of strength and consolidation of soils.</td></tr>
<tr><td colspan="7"><u>Outline Syllabus</u>
• Formation and types of soils:
• Basic properties and classification of soils: Mass / Volume relationships, Particle size analysis, Atterberg limits, Classification of soils by the Unified Classification System
• Compaction of soils: Factors affecting compaction, Standard and Modified Proctor compaction tests, Control of compaction in the field
• Total and effective stress in soils
• Flow of water through soils: Concept of head, coefficient of permeability, Darcy’s law, measurements of permeability in the laboratory, and the field.
• Basic concepts of consolidation of saturated clays
• Basic concept of shear strength of soils</td></tr>
</table>