

1.2.2 Description of courses

M.Sc. (Environmental Engineering)

CV6501 Water Treatment and Process Design

AUs: 3

Prerequisites: NIL

Semester 2

Planning and design of water treatment plants. Treatment processes. Ion exchange and membrane processes. Desalination. Activated carbon adsorption. Ultra-pure water.

CV6502 Contaminated Site Assessment and Remediation

AUs: 3

Prerequisites: NIL

Semester 2

Site assessment and remediation issues. Hydrogeological and geochemical aspect of site characterisation. Contaminant fate and transport in the subsurface environment. Site remediation practice. Principles and application of remedial technology.

CV6503 Wastewater Treatment and Process Design

AUs: 3

Prerequisites: NIL

Semester 2

Selection and use of wastewater treatment processes leading to rational design of overall systems. Advanced processes in anaerobic treatment and nutrient removal. Wastewater reclamation and reuse. Sludge treatment and disposal.

CV6504 Hazardous Waste Treatment and Recovery

AUs: 3

Prerequisites: NIL

Semester 1

Definitions and legislation. Waste minimisation. Treatment technologies: stabilisation, thermal, physical, chemical and biological treatment. Application. Landfill and remediation.

CV6505 Water Quality Modelling

AUs: 3

Prerequisites: NIL

Semester 1

Historical development of water quality models. Fundamentals of completely and incompletely mixed systems. Physical aspects of aquatic environments. Modelling of water quality parameters in rivers, estuaries and lakes.

CV6511 Industrial Waste Management

AUs: 3

Prerequisites: NIL

Semester NIL

Waste sources, characteristics, generation, collection and regulations. Source reduction and waste minimisation. Problems and future trends. Waste conversion and disposal technologies. Current industrial practice: solid, liquid and hazardous waste management. Case studies.

CV6512 Integrated Solid Waste Management

AUs: 3

Prerequisites: NIL

Semester 2

Integrated solid waste management and planning. Waste generation, characterisation and quantities. Reduction, reuse and recycling. Landfill: design, operation, closure, rehabilitation and remediation. Incineration: design, operation, air emission control and ash disposal. Biological and chemical technologies.

CV6521 Air Quality Management

AUs: 3

Prerequisites: NIL

Semester 1

Classification and legislation. Atmospheric properties. Meteorological conditions, pollutants distribution and interaction. Engineered systems for removal of particulate, biological and gaseous pollutants. Indoor air quality. Monitoring and models. Global warming.

CV6531 Environmental Biotechnology

AUs: 3

Prerequisites: NIL

Semester 1

Historical development. Microbial diversity and metabolism. Microbial ecology. Recombinant DNA technology. Molecular probes. Applications in oil spill bioremediation, wastewater and solid waste treatment. Bioaerosols. Biotechnology and sustainable development.

CV6532 Environmental Management Systems

AUs: 3

Prerequisites: NIL

Semester NIL

Overview. The Environment and global problems. EIA, LCA and risk analysis methodologies. ISO 14000: general guidelines, environmental auditing, labeling, performance evaluation, LCA scope and impact assessment. Socioeconomic impacts.

CV6533 Environmental Chemistry

AUs: 3

Prerequisites: NIL

Semester NIL

Fundamental principles of mass transport. Chemical partitioning and transformation in surface waters, the subsurface environment and the atmosphere. Mass balance and reactions.

CV6551 Special Topics in Environmental Engineering

AUs: 3

Prerequisites: NIL

Semester NIL

This course introduces recent developments and advances in topics of current interest.

CV6601 Contaminant Transport

AUs: 3

Prerequisites: NIL

Semester NIL

Fundamental equations of fluid flow and Transport. Laminar and turbulent diffusion. Mixing and transport in receiving waters: Advection, diffusion and dispersion. Conservative and non-conservative Substances. Jets and plumes. Numerical techniques.

CV6602 Urban Hydrology

AUs: 3

Prerequisites: NIL

Semester NIL

Rainfall for urban stormwater design. Rainfall abstractions. Urban runoff processes. Design of stormwater drainage systems. Quality of urban runoff. Urban stormwater management. Effects of urbanisation on runoff quality and quantity.

M.Sc. (Environmental Science and Engineering)

SSP 101B# Mechanics of Fluids

AUs: 4

Prerequisites: NIL

Summer Qtr

Physical properties of fluids and their effect on flow behavior.

SSP 262A Hydrodynamics

AUs: 4

Prerequisites: NIL

Summer or Autumn Qtr

The flow of incompressible viscous fluid.

SSP 262B Transport and Mixing in Surface Water Flows

AUs: 4

Prerequisites: NIL

Winter Qtr

Application of fluid mechanics to problems of pollutant transport and mixing in the water environment.

SSP 262C# Modelling Environmental Flows

AUs: 4

Prerequisites: NIL

Spring Qtr

Introduction to turbulence models and to basic concepts of numerical simulation and computer modelling of turbulent flows in the environment.

SSP 264C# Sediment Transport Modelling

AUs: 3

Prerequisites: NIL

Summer Qtr

The physical processes and modelling of sediment transport in estuaries, rivers, and coastal zones.

SSP 265C# Water Resources Management

AUs: 2

Prerequisites: NIL

Summer Qtr

Focus is on the basic principles of surface and ground water resources management in the context of water scarcity and hydrologic uncertainty.

SSP 268# Groundwater Flow

AUs: 4

Prerequisites: NIL

Summer Qtr

Study of flow and mass transport in porous media through analytical techniques.

SSP 270 Movement and Fate of Organic Contaminants in Surface Waters and Groundwater

AUs: 3

Prerequisites: NIL

Summer Qtr

Transport of chemical constituents in surface and groundwater.

SSP 271A Physical and Chemical Processes

AUs: 3

Prerequisites: NIL

Winter Qtr

Physical and chemical unit operations for water treatment.

SSP 271B Environmental Biotechnology

AUs: 4

Prerequisites: NIL

Winter Qtr

Stoichiometry, kinetics, and thermodynamics of microbial processes for the transformation of environmental contaminants.

SSP 273 Aquatic Chemistry

AUs: 3

Prerequisites: NIL

Summer or Autumn Qtr

Chemical principles and their application to the analysis and solution of problems in aqueous geochemistry

SSP 273A Water Chemistry Laboratory

AUs: 2

Prerequisites: NIL

Autumn Qtr

Laboratory application of techniques for the analysis of natural and contaminated waters.

SSP 274A Environmental Microbiology I

AUs: 3

Prerequisites: NIL

Summer or Autumn Qtr

The fundamental aspects of microbiology and biochemistry.

SSP 276# Introduction to Human Exposure Analysis

AUs: 3

Prerequisites: NIL

Summer Qtr

Scientific and engineering issues involved in quantifying human exposure to toxic chemicals in the environment.

SSP 278A Air Pollution Physics and Chemistry

AUs: 3

Prerequisites: NIL

Autumn Qtr

The sources and health effects of pollutants

SSP 376 Organic Analyses in Environmental Sciences

AUs: 3

Prerequisites: NIL

Spring Qtr

Theory and practice of modern instrumental methods used in environmental engineering and science.

SSP 377# Membrane Technology for Water/Wastewater Treatment and Reclamation

AUs: 2

Prerequisites: NIL

Spring Qtr

Introduction to membrane processes, modules, performance and fouling.

M.Sc. (International Construction Management)

CV6212 Construction Management

AUs: 3

Prerequisites: NIL

Semester 1

Structure and organisation construction industry; Company and project organisational concepts; Construction contracts and professional issues in construction management; Management of the construction process including costing, estimating and tendering; Technology and application; Case studies.

CV6213 Construction Technology

AUs: 3

Prerequisites: NIL

Semester 2

Intelligent and green buildings technology; Building inspection, appraisal, repair and strengthening; Introduction to fire engineering; Introduction to tall buildings, long span structures and coastal structures.

CV6214 Project Financing

AUs: 3

Prerequisites: NIL

Semester 1

Financial and economic evaluation techniques related to Public-Private-Partnership (PPP) and Build-Operate-Transfer (BOT) infrastructure and construction projects as well as organisations;

Project financing and assembling of financial packages to support construction bids; Management of financial risks and taxation relevant to overseas contracts.

CV6215 International Construction and Marketing

AUs: 3

Prerequisites: NIL

Semester 1

International construction market; Market planning and business development; Strategic planning and management techniques; Construction joint ventures, partnering and strategic alliances; Developing competitive strategies for international construction; Management of international projects; Case studies.

CV6216 Techniques of Project Planning and Control

AUs: 3

Prerequisites: NIL

Semester 1

Techniques for planning and control in managing construction projects; Concepts of network techniques; Resource and cost planning; Operations research methods and Project planning and control.

CV6217 Information Technology in Construction

AUs: 3

Prerequisites: NIL

Semester 2

Computerised project management systems; Internet technology; Web applications in construction; Data processing and applications in pricing, tendering, scheduling and cost control system; Simulation of construction operations.

CV6218 Value Engineering and Managing Quality

AUs: 3

Prerequisites: NIL

Semester 2

Environmental Management System and ISO 14000; TQM and quality assessment in Singapore's construction industry; Systems Approach to Value Engineering; Value Engineering in a broader context; Case studies.

CV6220 Construction Law

AUs: 3

Prerequisites: NIL

Semester 2

Basic Principles of Contract, Tort and Construction Law; Roles and Obligations of Architects, Engineer and Surveyors, Pricing and Claims Practice; Performance and Completion; Variations, Defects, Delays, Damages and Extension of Time; Case Studies.

CV6221 Advanced Construction Law and Dispute Resolution in the Construction Industry

AUs: 3

Prerequisites: C6110

Semester 1

Subcontractors; Vesting of Plant and Materials, Assignment and Novation; Forfeiture and Determination of Contract; Indemnities and Guarantees; Insolvency; Payment, Certificates and Adjudication; Various Dispute Resolution Process; Case Studies.

M.Sc. (Maritime Studies)

MT6201 Shipping Management 1

AUs: 3

Prerequisites: NIL

Semester 1

This course introduces students to the role of maritime transport in international trade and to the specific tasks that face the executives of shipping companies and other organisations in the maritime industry.

MT6202 Shipping Management 2

AUs: 3

Prerequisites: NIL

Semester 2

This course provides student an understanding of the commercial practices and the legislative and contractual framework of international shipping.

MT6101 Project Management

AUs: 3

Prerequisites: NIL

Semester 1 or 2

This course addresses the considerable changes seen in recent years in areas where project work is used. The planning and organisation of projects as well as their management are discussed.

MT6102 Maritime Economics

AUs: 3

Prerequisites: NIL

Semester 1 or 2

This course deals with the economic aspects of the maritime industry. Topics covered include: Patterns of maritime trade; Patterns of shipping markets and Economics of shipping services.

MT6103 Strategic Planning

AUs: 3

Prerequisites: NIL

Semester 1 or 2

The essence of corporate strategy is the creation of sustainable competitive advantage, i.e. creating products and services that the customers perceive as valuable and unique. In this course, students will get acquainted with several models that are useful in the development of sustainable competitive advantage.

MT6104 Cross Cultural Management

AUs: 3

Prerequisites: NIL

Semester 1 or 2

This course increases participants' awareness and skills when preparing for and conducting international business negotiations. This will also require understanding the importance of intangible factors, such as core beliefs and values which characterise both national and business cultures.

MT6204 Ship Operations, Brokering and Chartering

AUs: 3

Prerequisites: NIL

Semester 1 or 2

Ship Operations: Stowage plans, bunkering, crewing, maintenance, scheduling and fuel. Harbor infrastructure. Marine environment protection. Shipping safety. Legal aspects of chartering and purchase of ships. Roles of the broker and liner agent. Legislation and practice. Chartering: Operation of freight markets. Multiple charter parties. Special charter forms - Vegoil, Chemicals, Supply Ships, Towage.

MT6301 Maritime Logistics

AUs: 3

Prerequisites: NIL

Semester 1 or 2

This course examines the strategic role of shipping in global supply chains. Case studies are used to improve the students strategic logistics skills.

MT6302 Port Management

AUs: 3

Prerequisites: NIL

Semester 1 or 2

This course aims to develop a thorough grasp of different aspects of port activities by providing detailed understanding of the principles and practices of port management within the framework of overall transportation systems.

MT6304 Marine Insurance

AUs: 3

Prerequisites: NIL

Semester 1 or 2

The course offers a thorough introduction to the history, framework, practice, economics and legal understanding of International Marine Insurance. In addition to a historic view of the development of marine insurance and its origin, there will be an introduction to the different insurance markets and their geographical positions.

MT6401 Environmental Shipping

AUs: 3

Prerequisites: NIL

Semester 1 or 2

The objective of this course is to introduce students to the various causes of pollution to the marine and atmospheric environments due to shipping related activities. Environmental issues such as ship waste, oil pollution, anti-fouling paints, ship breaking activities, ship litter (including plastics), ballast water management and ship emissions are addressed.

Graduate Diploma in Airport Engineering

CV6201 Airport System and Planning

AUs: NIL

Prerequisites: NIL

Once a year

Airport facilities and utilities requirements. Planning process. Traffic forecasts. Air traffic control and nav aids. Capacity and delay analysis. Airport configuration. Environmental issues. Land use planning. Site selection. Airport access. Airport master plan. Passenger and cargo terminals.

CV6202 Airport Design and Construction

AUs: NIL

Prerequisites: NIL

Once a year

Aircraft performance characteristics. Airfield geometric design. Geotechnical engineering. Pavement design. Drainage design. M & E systems. Airfield lighting and marking. Site preparation. Pavement construction. Contracts, documents and project management.

CV6203 Airport Maintenance

AUs: NIL

Prerequisites: NIL

Once a year

Maintenance management. Pavement management, other surface elements, visual aids. M & E systems maintenance and management. Structural appraisal and repairs. Airport operation and management. Resource allocation. Landscaping.

Graduate Diploma in Construction Management

CV6212 Construction Management

AUs: 3

Prerequisites: NIL

Semester 1

Structure and organisation construction industry; Company and project organisational concepts; Construction contracts and professional issues in construction management; Management of the construction process including costing, estimating and tendering; Technology and application; Case studies.

CV6213 Construction Technology

AUs: 3

Prerequisites: NIL

Semester 2

Intelligent and green buildings technology; Building inspection, appraisal, repair and strengthening; Introduction to fire engineering; Introduction to tall buildings, long span structures and coastal structures.

CV6214 Project Financing

AUs: 3

Prerequisites: NIL

Semester 1

Financial and economic evaluation techniques related to Public-Private-Partnership (PPP) and Build-Operate-Transfer (BOT) infrastructure and construction projects as well as organisations; Project financing and assembling of financial packages to support construction bids; Management of financial risks and taxation relevant to overseas contracts.

CV6215 International Construction and Marketing

AUs: 3

Prerequisites: NIL

Semester 1

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CV6216 Techniques of Project Planning and Control

AUs: 3

Prerequisites: NIL

Semester 1

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CV6217 Information Technology in Construction

AUs: 3

Prerequisites: NIL

Semester 2

Computerised project management systems; Internet technology; Web applications in construction; Data processing and applications in pricing, tendering, scheduling and cost control system; Simulation of construction operations.

CV6218 Value Engineering and Managing Quality

AUs: 3

Prerequisites: NIL

Semester 2

Environmental Management System and ISO 14000; TQM and quality assessment in Singapore's construction industry; Systems Approach to Value Engineering; Value Engineering in a broader context; Case Studies.

CV6220 Construction Law

AUs: 3

Prerequisites: NIL

Semester 2

Basic Principles of Contract, Tort and Construction Law; Roles and Obligations of Architects, Engineer and Surveyors; Pricing and Claims Practice; Performance and Completion; Variations; Defects; Delays, Damages and Extension of Time; Case Studies.

C6111 Advanced Construction Law and Dispute Resolution in the Construction Industry

AUs: 3

Prerequisites: C6110

Semester 1

Subcontractors; Vesting of Plant and Materials, Assignment and Novation; Forfeiture and Determination of Contract; Indemnities and Guarantees; Insolvency; Payment, Certificates and Adjudication; Various Dispute Resolution Process; Case Studies.

M.Sc. (Civil Engineering)

CV6311 Soil Behaviour and Engineering Properties

AUs: 3

Prerequisites: Graduate Standing

Semester 1

Physical properties of soils. Hydraulic properties of soils. Compressibility and consolidation behaviour of soils. Stress-deformation and shear strength behaviour of soils. Measurements of strength, stiffness, compressibility, permeability and consolidation properties of soils by laboratory and in-situ testing methods. Evaluation of design parameters.

CV6312 Slope Stability and Ground Improvement

AUs: 3

Prerequisites: Graduate Standing

Semester 2

Slope stability: shear strength, total and effective stress analyses, methods of slices involving circular and noncircular slip surfaces, slope monitoring and stabilisation, case studies. Soil improvement: surface compaction, deep compaction, admixture stabilisation, reinforced soil, preloading and vertical drains. Pre-treatment and post-treatment assessment.

CV6313 Shallow and Deep Foundations

AUs: 3

Prerequisites: Graduate Standing

Semester 1

Footing and raft foundations: design considerations, bearing capacity, settlement, combined footings, soil-raft interaction analysis, pile-raft foundations. Deep Foundations: response of piles to vertical and horizontal loads, load transfer, dynamic pile testing and static pile load tests.

CV6314 Excavation and Earth Retaining Systems

AUs: 3

Prerequisites: Graduate Standing

Semester 2

Retaining structures: Lateral earth pressure, design of earth retention systems, concrete retaining walls, reinforced soil walls and anchored bulkheads. Supported excavation: overview of braced/anchored excavations in soil, evaluation of soil properties, stability of excavations, design of excavation support systems, ground movements associated with excavation, construction monitoring.

CV6315 Engineering Geology and Rock Mechanics

AUs: 3

Prerequisites: Graduate Standing Not offered in AY06/07

Engineering geology: plate tectonics, minerals, rock types and rock cycle, geological structures, rock dating and geological time scale, geological maps, hemispherical projection, geology of Singapore. Rock mechanics: rock mass classifications, laboratory measurements of strength and deformation properties of rocks, failure criteria, shear strength of discontinuities. Applications: rock foundations, stability of rock slopes, underground rock excavations.

CV6422 Statistical Methods for Transportation Analysis

AUs: 3

Prerequisites: Graduate Standing

Semester 1

Probability and statistical concepts. Sampling methods. Statistical Inference: estimation, hypothesis testing. Goodness-of-fit tests. Non-parametric procedures. Regression analysis. Time series analysis. Computer applications.

CV6423 Operations Research Methods in Transportation

AUs: 3

Prerequisites: Graduate Standing

Semester 2

Optimisation techniques for solving transportation problems. Linear and integer programming: problem formulation and solution. Network flow analysis: programming methods and models.

Queueing theory: arrival and service processes, model types. Deterministic solution to queueing problems.

CV6431 Airport System and Planning

AUs: 3

Prerequisites: Graduate Standing

Not offered in AY06/07

Introduction. Aviation system. Airport master planning process. Data requirements. Aviation traffic forecasts. Air traffic control and navigation aids. Capacity and delay analysis. Airport configuration. Environmental issues and land use planning. Airport site selection. Airport master plan.

CV6441 Pavement Engineering and Management

AUs: 3

Prerequisites: Graduate Standing

Semester 1

Pavement analysis and design philosophy. Material characterisation. Analysis and design of flexible and rigid pavements. Overlay design. Pavement management systems: pavement evaluation, performance, maintenance and rehabilitation. Selection of design alternatives.

CV6442 Advanced Traffic Engineering

AUs: 3

Prerequisites: Graduate Standing

Not offered in AY06/07

Advanced traffic survey methods. Traffic flow theory. Highway capacity analysis for weaving sections, ramp junctions and rural highways. Capacity analysis of signalised intersections. Traffic signal control optimisation. Traffic congestion management. Traffic calming.

CV6443 Traffic Impact and Safety Studies

AUs: 3

Prerequisites: Graduate Standing

Semester 2

Overview of transport project impacts. Trip and parking generation. Site traffic impact analysis. Assessment of environmental impacts of transport facilities: noise, pollutant emission, visual impact. Measures to mitigate traffic impacts. Road safety study: accident characteristics, analysis techniques, remedial and prevention measures.

CV6481 Urban and Regional Transport Planning

AUs: 3

Prerequisites: Graduate Standing

Not offered in AY06/07

National and regional transportation planning. Urban issues and the planning process. Economic, environmental and energy considerations. Transport and land use interaction. Travel patterns and planning of transport networks. Freight movement and facilities planning. Feasibility analysis of transport facilities. Transportation planning in developing countries.

CV6001 Finite Element Methods

AUs: 3

Prerequisites: Graduate Standing

Semester 1

Approximation theory for analysis of discrete and continuous engineering systems; formulation of displacement-based finite element method for linear analysis in solid and structural mechanics; isoparametric formulation and implementation; nonlinear analysis in solid and structural mechanics; analysis of field problems and fluid flow; solution of nonlinear equations.

CV6002 Advanced Strength of Materials

AUs: 3

Prerequisites: Graduate Standing

Semester 2

Stress and strain analyses; unsymmetrical bending of beams; torsion and shear centre; energy method; buckling; stress concentration and crack propagation; contact problem; failure criteria; introduction to micromechanics; impact load and dynamic property of materials.

CV6103 Structural Dynamics

AUs: 3

Prerequisites: Graduate Standing

Semester 1

Free and forced vibration of single degree of freedom structures; damping; convolution integral; state space method; free and forced vibration of multi-degree of freedom structures; numerical methods; structural response to seismic loading; response spectra; time history analysis and response spectra analysis; special topics.

CV6104 Behaviour and Design of Reinforced Concrete Structures

AUs: 3

Prerequisites: Graduate Standing

Semester 1

Properties of concrete; flexure, shear, and torsion theories; time-dependent behaviour; slender columns; fl at plate fl at slab systems; strut and tie models for design; design for wind and earthquake forces.

CV6105 Seismic Design of RC Structures

AUs: 3

Prerequisites: Graduate Standing

Not offered in AY 06/07

Properties of concrete; dynamic loadings: seismic, wind, and blast loadings; lateral load transfer mechanisms, beam-column joints, behaviour of structural walls, strut and tie models for reversed loading; design for wind and earthquake forces.

CV6106 Precast and Prestressed Concrete Structures

AUs: 3

Prerequisites: Graduate Standing

Not offered in AY06/07

Properties of concrete; prestressed concrete beams under flexure, shear, and torsion; time-dependent behaviour; statically indeterminate structures; post-tensioned slab systems; design of precast connections; bearing and non-load-bearing precast walls; moment resisting frames; precast buildings under lateral loads.

CV6107 Behaviour and Design of Steel and Composite Structures

AUs: 3

Prerequisites: Graduate

Standing Semester 2

Behaviour and design of steel structures: columns, beams, beam-columns and frames; behaviour and design of composite structures: shear connectors, composite beams, columns, slabs and joints.

CV6108 Analysis and Design of Tall Buildings

AUs: 3

Prerequisites: Graduate Standing

Semester 2

Philosophy and design criteria of tall buildings; structural systems for tall buildings: moment-resisting frames, shear walls, braced frames; P-Delta effects and instability; structural design process: functional requirements; design criteria and loading: dead, live, wind, and earthquake loads; preliminary and computer-aided proportioning; analysis of tall buildings; very tall buildings including framed tube, tube in tube, trussed tube and hat trusses, etc.

CV6109 Advanced Concrete Technology

AUs: 3

Prerequisites: Graduate Standing

Not offered in AY06/07

Concrete constituent materials; properties of fresh concrete: workability, superplasticiser, self-compacting concrete; hydration and microstructure formation of concrete: hydration process, microstructure; durability of concrete; cement replacement materials; evaluation of concrete structures; cracking in concrete, testing of hardened concrete, assessment of concrete quality.

CV6102 Fire Engineering Design of Structures

AUs: 3

Prerequisites: Graduate Standing

Not offered in AY06/07

Introduction to fire engineering, standard fire resistance tests, heat transfer analysis, design of fire protection for steel structures, behavior of isolated steel members in fire, design of composite steel beams and columns in fire, finite element analysis, case studies.

CV6161 Introduction of Explosives and Blast Loading

AUs: 3

Prerequisites: Graduate Standing

Semester 1

Explosion theory; chemistry of explosive compounds and mixtures; deflagrations and detonations; blast waves and their effects; safety, reliability

CV6162 Structural Response to Blast Loading

AUs: 3

Prerequisites: Graduate Standing

Semester 1

Introduction of structural dynamics; blast load and structural response characteristics; energy solutions; equivalent systems methods; numerical solution; damage index and control limits; stress wave propagation from surface and buried explosions; impact and ballistic loading and associated responses; human response to blast loading; M & E considerations; special topics.

CV6163 Design of Structures to Resist the Effect of Explosions

AUs: 3

Prerequisites: Graduate Standing

Semester 2

Blast effects on buildings: case histories of terrorist attacks and acts of war; identification of loading types and blast mitigation; ultimate design of reinforced concrete slabs and beams; ultimate design of steel structures to resist blast loading; blast door design; special considerations in explosive protective design. The emphasis will be on terrorist threats from vehicle bombs, but the fundamental concepts can be applied to other explosives scenarios.

CV6801 Sea Loads

AUs: 3

Prerequisites: NIL

Semester 2

Equations of motion, Morison's equation, Strip theory, Computation of loads, Radiation and diffraction, Green's theorem, Irregular waves, Wave spectra, Linearisation techniques, Non-Linear Phenomena, Wave slamming and wave breaking, Cable dynamics, Semi-submersible and tension leg platforms, Mathieu's equation and instabilities.

CV6802 Advanced Hydrodynamics

AUs: 3

Prerequisites: NIL

Semester 1

Fluid properties, Types of flows, Fundamental mathematic operations, Fluid statics, Mathematical models, Boundary layer flows, Incompressible turbulent flow, Potential flow theory, Kinematics of water waves, Linear and nonlinear wave models, Standing and progressive waves, Dispersion relationship, Deep and shallow approximations, Dynamics of water waves, Wave fields, Seiching, Wave fraction, Snell's law, Wave breaking, Wave diffraction and ship waves.

CV6803 Numerical Methods

AUs: 3

Prerequisites: NIL

Semester 2

Basic equations of fluid dynamics, Inviscid and incompressible flows, Viscous fluid flows, Numerical stability, Numerical solutions to partial differential equations, Computer-based analysis of flow problems, Application of MATHCAD.

CV6804 Advanced Offshore Engineering

AUs: 3

Prerequisites: NIL

Semester 1

Flexible risers, SCRs, TLPs and SPARs, Flow assurance, Shielding effects, Tensioned beams, Natural frequency, Modes of vibration, Galerkin's method, Numerical integration, Dynamic analysis, Mooring lines, Catenary equations, Vortex-induced vibration, Flow around fixed and flexible cylinders, Mean and oscillatory forces, Lock-in vibration, 2D and 3D modelling, Sheared ocean currents, Modal analysis, Fatigue life calculation, Suppression devices, Riser monitoring, Latest marine riser R & D.

CV6805 Design of Offshore Structures

AUs: 3

Prerequisites: NIL

Semester 2

Design criteria and loadings, Wind and wave forces, Offshore structural analysis, In-place analysis, Earthquake analysis, Dynamic analysis, Limit-state design, Strength of tubular members and joints, Installation design and procedure, Load out analysis, Transportation analysis, Launch analysis, Lift analysis, Miscellaneous design (Pile and Mud mat, boat-landing, barge bumpers, riser guides, corrosion protection, topside components).

CV6806 Submarine Pipeline Design

AUs: 3

Prerequisites: NIL

Semester 1

Route selection, Material specifications, Pipeline system, Design philosophy, Criteria, Strength, Bending, Buckling and collapse, Stability, Upheaval movement and buckling, Corrective action, Lateral buckling, Depression and elevated obstruction stresses, Span formation, Vortex shedding, Risk and safety assessment, Pipelay analysis, Pipeline construction, Pipeline installation, Inspections and Monitoring, Risers, Corrosion.

CV6807 Fatigue and Fracture of Marine Structures

AUs: 3

Prerequisites: NIL

Semester 2

Mechanism of fatigue and fracture, Fracture toughness and strength, Damaged and cracked tubular joints, Fatigue design principle, S-N curves, Strength improvement, Nominal, hot spot and notch stress approach, Stress concentration factors, Fatigue loading and stresses, Fatigue analysis of tubular joints, Simplified fatigue assessment, Spectral fatigue analysis and design, Material selection and criteria, CTOD design curve, CEEB R6 diagram, Failure assessment diagram, Application of Fracture Mechanics, Assessment of integrity of structures containing defects, Application of BEASY.

CV6808 Safety Management and its Applications

AUs: 3

Prerequisites: NIL

Semester 1

Offshore disasters and accidents, Safety management, Safety assessment methods, Risk-based concept, Integrated safety method, FSA method, Safety terms and safety management, Safety case concept, Hazard identification, Risk assessment (Qualitative and Quantitative), HAZOP approach, Probability of occurrence, Risk matrix, Fault and event tree analysis methods, Risk assessment strategy, Risk reduction and emergency preparedness, ALARP and Pareto principles, cost benefit analysis, Human factors and safety culture.