3+1+1 Courses for first +1 year, Civil Engineering(updated as of 14 Oct 2025)

Courses are categorised under 5 key specialisations. (click to navigate)

Geotechnical Engineering
Transport & Urban Mobility
Sustainable Climate Resilience
Structural Engineering
Infrastructure Digitalization & Management

Disclaimer: Courses are not offered every academic year or semester, please refer to latest timetable for each semester's course offering. Course title, contents and offering are at the discretion of NUS-CEE department and may change according to prevailing policies.

NUS Academic Calendar: https://www.nus.edu.sg/registrar/calendar

2-unit courses: Taught in mini-semester A or B

4-unit courses: Taught in regular semester

8-unit courses: Equivalent to 2 regular semesters worth of work

Course Code	Course Title	Units	Specialisation	Pre-requisite/ Co-requisite	Preclusion	Description
CE4104N	Final Year Project	8	-	-	-	The project offers the opportunity for the student to develop research capabilities. It promotes creative thinking and allows independent work on a prescribed research project. Students undertake the project over two semesters. Each student is expected to spend not less than 9 hours per week on the project chosen from a wide range, covering various civil engineering disciplines. Assessment is based on the student's working attitude, project execution and achievement, an interim report and presentation, dissertation and final oral presentation. This course is only available to non-graduating students, by invitation from the Department.
CE5101	Seepage & Consolidation of Soils	4	Geotechnical Engineering	-	-	This is an advanced course in flow through a two-phase medium. The topics that are covered include steady state seepage and basic transient seepage, basic contaminant transport processes, measurement of hydraulic transport parameters, and its applications to dewatering of excavations and seepage through embankments as to their influence on slope stability. Consolidation theory from 1-D to 3-D consolidation analysis, and methods of accelerating consolidation, with application to computing settlements of foundations. Students are taught Darcy's Law, continuity equation, coupling between effective stress and pore pressure, and the solution methods inclusive of FEM modelling. The goals of the course are analysis of seepage problems, analysis of consolidation problems, design methods to accelerate consolidation to solve stability and settlements problems in geotechnical engineering.
CE5104QA	Tunnelling in Soils	2	Geotechnical Engineering	-	CE5104 & CE5104A	This is an advanced course on analysis and design of tunnels in soils. The topics covered include bored tunnelling methods, stability of underground openings, ground movement prediction due to tunnels, effects of ground movements on buildings and structures, instrumentation and monitoring, and stresses on lining. The creation of underground structures to form subways, underpasses, metro stations and other uses is an increasing requirement in major urban areas worldwide. Students are taught the various methods of construction for creating underground space.
CE5104QB	Tunnelling in Rocks	2	Geotechnical Engineering	-	CE5104 & CE5104B	This is an advanced course on analysis and design of tunnels in rocks. The topics covered include tunnelling methods in rocks, construction of caverns, New Austrian Tunnelling Method and stability of underground openings in rocks. The creation of underground structures to form subways, underpasses, metro stations and other uses in greater depths would likely encounter excavation in rocks. Students are taught the various methods of construction for creating underground space.
CE5106QA	Ground Improvement - Hydraulic, Vibratory & Chemical	2	Geotechnical Engineering	Background in soil mechanics or equivalent	CE5106 & CE5106A	This is a course on the principle of ground improvement techniques, as well as its design, construction and monitoring in geotechnical engineering works. Topics covered include general ground improvement principles and design considerations, techniques of improving granular soils, techniques of improving cohesive soils. Field operation requirement and construction field controls, monitoring, and performance evaluation, specification and acceptance criteria. Case studies on various techniques will be presented and discussed. This course will focus on hydraulic method for soft clay (PVD with preloading, PVD with vacuum etc), Vibratory method for Sandy soils, and cement treatment method (Grouting and Deep cement mixing etc). Participants are taught the basic principles of various ground improvement techniques, and how to select the most appropriate ground improvement techniques to be used in specific circumstances.
CE5106QB	Ground Improvement - Dynamic, Geosynthetic & Inclusions	2	Geotechnical Engineering	CE5106QA	CE5106 & CE5106B	This is an advanced course on ground improvement techniques for difficult ground as well as its design, construction and monitoring in geotechnical engineering projects. Topics covered include the special requirement for advanced ground improvement techniques, difficult ground (peaty soil, mixed soils in tunnelling, cavity etc), principles and design considerations for various advanced ground improvement techniques (dynamic method, dynamic method combine with PVD, geosynthetics, soil nailing etc), field controls and monitoring, field evaluation – specification, performance evaluation and acceptance criteria, and case study. Participants are taught the basic principles of various advanced ground improvement techniques, and how to select as well as combine a few ground improvement methods to be used in specific circumstances where soil are difficult or/and the project requirements are very stringent.
CE5107QA	Pile Foundation Design	2	Geotechnical Engineering	-	CE5107 & CE5107A	This is an advanced course in deep foundation engineering. Topics covered include site investigation for deep foundation, general bearing capacity theorem, overview of pile installation methods, axial pile capacity and deflection, pile load transfer mechanism, and laterally loaded piles as well as group pile issues. Participants will learn how to deal with design and construction issues pertaining to deep foundations under more general and realistic practical situations. Specific learning objectives include performing design calculations for piles and pile groups.

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CE5107QB	Advanced Topics in Pile Foundation Design	2	Geotechnical Engineering	CE5107QA	CE5107 & CE5107B	This is an advanced course in deep foundation engineering. Topics covered include piles subject to ground movement, piles in difficult ground, special pile foundation, pile driving analysis and dynamic testing, and static pile load tests. Participants will learn how to deal with design and construction issues pertaining to deep foundations under more general and realistic practical situations.
CE5108QA	Key Principles and Concepts of Earth Retention Systems	2	Geotechnical Engineering	-	CE5108 & CE5108A	Together with "CE5108QB Deep Excavations Analysis and Modelling", this is an advanced course in earth-retaining structures and deep excavations. Topics include earth pressure theories, rigid retaining structures, flexible retaining structures, cellular cofferdams, retaining walls for deep excavations, support systems for deep excavations, and field monitoring. Participants are taught to deal with design and construction issues pertaining to a spectrum of earth-retaining systems from low rigid retaining walls to flexible support systems for deep excavations. They will also learn to apply the methods of limit state, such as BS8002 and Eurocode7, to the design of rigid and flexible retaining walls. Applications of commercial geotechnical FEM softwares are taught to aid in design of deep excavations to limit ground deformations and satisfy SLS requirements. At the end of the course, participants are taught the application of advanced earth pressure theories, selection of appropriate retaining structures, and verification of capacity and movement requirements, using limit equilibrium and FEM analysis tools.
CE5108QB	Deep Excavations Analysis and Modelling	2	Geotechnical Engineering	CE5108QA	CE5108 & CE5108B	This course builds upon the knowledge and skills acquired in “Key Principles and Concepts of Earth Retention Systems” to cover the topic of deep excavations related to deep shafts and multi-strut supported walls. Participants are taught to deal with design and construction issues pertaining to deep excavations, such as drained and undrained conditions, as well as field monitoring practices. Applications of commercial geotechnical FEM software are taught to aid in design and analysis of deep excavations to limit ground deformations and satisfy both serviceability requirements as well as Eurocode 7 ultimate limit states.
CE5112	Structural Support Systems for Excavation	4	Geotechnical Engineering	CE5108QA & CE5108QB	-	Students will learn the various methods of excavation construction and apply the fundamental knowledge of structural mechanics to design a wide range of earth retaining walls and their support systems. The key focus is to develop the capability to design various types of retaining walls, ground anchorage, walers, struts, kingposts, bracing and connection details. It will also cover the design of working platforms which are often required in deep excavations, as well as methods of jointing and splicing to allow incorporation of instrumentation. The course will cover both steel and reinforced concrete retaining walls, such as sheetpile, soldier piles, timber lagging, contiguous bored piles, diaphragm walls and etc. The course enables students to acquire further knowledge on soil-structure interaction and gain practical skills through the lectures, case studies and design projects.
CE5113QA	Geotechnical Site Investigation	2	Geotechnical Engineering	-	CE5113 & CE5113A	This course teaches the essential concepts and methodology for the planning, design and implementation of geotechnical ground investigation for infrastructure, underground construction, and built environment construction. The course will be broadly divided into two parts. The first part covers various aspects of site investigation such as the planning, design, density of bore holes, sampling technology and disturbance. The second part covers various aspects of in-situ and laboratory testing of soils and rocks. The course will cover ground investigation concepts and practices according to new Eurocode EC7. This course enables participants to acquire the knowledge and practical skills through the lectures, case studies and projects.
CE5113QB	Geophysical Methods & Geotechnical Monitoring	2	Geotechnical Engineering	CE5113QA	CE5113 & CE5113B	This course teaches the essential concepts and methodology for the planning, design and implementation of geophysical methods for geotechnical site investigation, and ground instrumentation and monitoring programmes. The course will be broadly divided into two parts. The first part covers the planning and practices of various type of geophysical methods used in geotechnical site investigation. Basic type of geophysical methods seismic, resistivity and ground radar and others will be covered. The second part covers various aspects of ground instrumentation and sensors for the measurement and monitoring of ground movement, drawdown, excess pore pressures, strut forces, wall deflection and settlement. Concept and practices of the observational methods in geotechnical works will be covered. This course enables participants to acquire the knowledge and practical skills through the lectures, case studies and projects.

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CE5203	Traffic Flow & Control	4	Transport & Urban Mobility	-	-	Understanding traffic flow phenomena and being able to describe them with mathematical models is fundamental to the effective traffic management and control strategies. This course aims to introduce students to the various theories and mathematical models that describe traffic flow and traffic operations. Deterministic and probabilistic, as well as microscopic and macroscopic models that can be used to analyse and control traffic will be covered. The major topics include measurement of traffic flow parameters, car-following, gap acceptance, traffic stream models, shock waves, platoon dispersion, kinematic and hydrodynamic flow models, unsignalised and signalised intersections control.
CE5204	Pavement Design & Rehabilitation	4	Transport & Urban Mobility	-	-	The course introduces students to the basic principles and concepts of pavement design and rehabilitation for airfields and roads. Students will learn to understand the major aspects of structural and functional requirements of pavement, including load bearing capacity, material and thickness selection, durability against traffic and environmental loading, drainage and safety needs. Students will also learn the mechanisms of pavement distresses, and techniques and approaches of pavement rehabilitation. The principles of pavement rehabilitation in respect of nondestructive condition evaluation, pavement performance modelling and remaining life prediction will be addressed. The course requires each student to do a term project that involves identification of an aspect of pavement design or rehabilitation that warrants further study and description of the approach and technique of the proposed study. The course enables the students to acquire the knowledge of designing, maintaining and rehabilitating road and airfield pavements.
CE5205	Transportation Planning	4	Transport & Urban Mobility	-	-	This course will provide the student with an intermediate course in the theory and practice of urban transportation planning, programming, and modeling of supply and demand components of transportation systems; to acquaint the student with the state of transportation planning practice as contrasted with analytical models, and familiarize the student with the history and status of transportation planning activities. At the end of this course, the student is expected to understand the "4-step" process, harness methodologies and tools used for transportation planning, and be capable of observing, analyzing, modeling, and inferring real-world transportation planning problems through tools learned.
CE5206	Urban Public Transportation Systems	4	Transport & Urban Mobility	-	-	Urban public transportation, including public bus and massive rapid transit (MRT), plays a critical role for people's daily life in the large cities such as Singapore, Hong Kong and London. This course introduces fundamental concepts, tangible operational strategies and planning as well as deign principles for urban public transportation systems. The major topics include public transit operations and service scheduling; capacity, speed, accelerated and special operations; data collection methods; performance assessment methods; ridership forecasting methods; transit assignment models; high ridership corridor operational strategies; modelling public transportation network design.
CE5208	Transport Infrastructure Asset Management	4	Transport & Urban Mobility	-	-	Urban smart cities consist of highly integrative multimodal transportation infrastructural assets that require condition monitoring, performance prediction, selection of treatment alternatives to ensure that the overall systemic transport infrastructures are performing to standards, reliable and resilient. This course aims to equip students with the engineering skills required for managing urban streets/highway and urban rail transport infrastructural assets.
CE5209	Transportation Data Analytics and Modeling	4	Transport & Urban Mobility	-	-	The transportation industry has been collecting massive amounts of data captured from different sources and modern transport systems uses this data for planning, design, operations and management. In this course, students will learn the various forms of transportation data that are collected from modern systems and how to analyse this data. Skills such as statistical modeling, spatial and temporal data analytics, discrete choice modeling and machine learning will be covered in the course.
CE5210	Intelligent Transportation Systems and Simulation	4	Transport & Urban Mobility	-	TCE5025	Intelligent transportation systems and its simulation are crucial for efficient and effective management of urban transportation and mobility in modern cities. A broad range of diverse technologies, including information processing, computing, communications, control and electronics can be applied to our transportation systems and many simulation methods are adopted by transport agencies. The topics covered in this course include state-of-the-practice and state-of-the-art ITS technologies and simulation methods. This course enables the student opportunity acquiring the knowledge and practical skills through the lectures, field investigations, and course projects.

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CE5211	Transportation Management & Policy	4	Transport & Urban Mobility	-	TCE5026	This course is designed to provide senior level undergraduate and graduate students with an overall view of the transportation systems, means of managing and influencing the systems to achieve certain goals. The topics covered include the characteristics of land, sea and air transportation systems; roles and structure of government agencies in transportation management; environmental and social impact of transportation systems, travel demand management; public transport management; models of financing transportation services; regulation and deregulation of transportation services; roles of intelligent transportation systems in system management and policy implementation; case studies of transportation policies in several countries.
CE5212	Intermodal Transportation Operations	4	Transport & Urban Mobility	-	-	The course will critically examine the dimensions of an integrated inter-modal transport system in relation to the changing logistics and supply chain practices of procurement, production and distribution. Themes and issues studied include the analysis of inter-modal choices using the total cost concepts in distribution, the international-domestic interface, advanced technologies in inter-modalism, the role of government in inter-modal integration. The course will also introduce simulation analysis for multi-modal operations, including building, calibration and validating models, output analysis and application programming interface.
CE5214QA	Energy Demand Analysis for the Built Environment	2	Transport & Urban Mobility	-	-	This course will equip students with tools to estimate and manage the energy demand for urban transport infrastructures. The course will start by providing a background of energy data and accounting in transport sector, followed by setting microeconomic foundation. Subsequently, methodologies for the disaggregate analysis of transport energy demand will be introduced. A case study of policies related to electric vehicles and their impact on energy demand will be discussed. The course will conclude with approaches to managing the energy demand for urban infrastructures.
CE5214QB	Mobility, Climate Change, and Energy Markets	2	Transport & Urban Mobility	-	-	This course will teach concepts related to the supply side of energy systems focusing on the transport sector. The course will start with supply-side concepts of microeconomics, followed by an analysis of energy investments in urban infrastructures. The policies to reduce GHG emissions in road transport will then be discussed. A case study of grid-based electricity supply in the era of electric vehicles will be introduced. It will conclude with supply-side policies to mitigate the impact of mobility on climate. The course will equip engineering students with tools to interact with energy economists.
CE5308QA	Coastal Processes and Protection	2	Sustainable Climate Resilience	-	-	The course covers covers some basics of nearshore hydrodynamics, including wave shoaling, wave refraction, and surf zone processes (wave breaking, wave-induced setup, and longshore current). The student will also be introduced to the concepts of coastal boundary layer flows, which determines the driving forces for coastal sediment transport, e.g., bottom friction. Additionally, aquatic vegetation's ability to curb coastal erosion will be discussed.
CE5308QB	Sediment Transport and Coastal Protection	2	Sustainable Climate Resilience	-	-	This course will introduce coastal processes of sediment transport, coastal erosion due to waves, current and sea-level rise, as well as protections against coastal erosion. The students will begin with learning the basic concepts of sediment transport. Fundamental knowledge of typical coastal processes will then be introduced, e.g. cross-shore and longshore sediment transport, the effect of sea level rise on coastline recession, the effects of coastal defense structures on beach morphology, and coastal protection measures such as beach nourishment. In the presence of coastal structures such as seawalls and breakwaters, the scour problem will also be introduced.
CE5310	Hydroinformatics	4	Sustainable Climate Resilience	-	-	Hydroinformatics is concerned with the development and application of mathematical modelling and advanced information technology tools to hydraulics, hydrological and environmental problems of urban, inland and coastal waters. On the technical side, in addition to computational hydraulics, hydroinformatics has a strong interest in the use of techniques originating in data-driven techniques, such as artificial neural networks, support vector machines and evolutionary programming.

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CE5312	Open Channel Hydraulics	4	Sustainable Climate Resilience	-	-	This course introduces the principles and analysis of flows in open channels and coastal environments. The first half aims to build foundational knowledge on steady flows in open channels, which covers fundamental concepts and governing laws of fluid mechanics, including the conservation of mass, momentum, and energy. Key topics such as the hydraulic jump, uniform flow, gradually varied flow, and rapidly varied flow will be introduced and applied to the computation of flow characteristics inside the open channel. The second half focuses on unsteady flows in open channels (e.g. river floods) and coastal environments (e.g. long waves such as tides, tsunamis, and storm surges). Students will learn to apply this knowledge to practical problems, including coastal flow computations and flood routing in open channels. Both analytical and numerical methods will be discussed.
CE5315	Climate Science for Engineers	4	Sustainable Climate Resilience	-	-	This course introduces fundamental mathematical and physical elements of the Earth climate with specific focus on clouds, precipitation, energy budget, planetary boundary layer and extreme weather phenomena. This knowledge is relevant for a better assessment of water and energy resources and impact assessments. Beyond introducing fundamental climatic processes, the course provides methods for the stochastic generation of climatic variables in a stationary and changing climate. It finally discusses broadly issues related to greenhouses gas emissions and future climate projections, outlining causes and potential solutions.
CE5316QA	Water Resources for Smart and Liveable Cities: Intro	2	Sustainable Climate Resilience	-	-	Students will be introduced to the basic issues of collecting and using data as applied to urban hydraulic and hydrological systems. Topics to be covered will include data, data collection and internet of things (IOT), data storage, meta-data, and an introduction to Geographical Information Systems, and data visualization. Students will work on a project utilizing an actual instrumented catchment to appreciate the practical issues. By the end students should appreciate the issues related to capturing and visualizing hydraulic related data for smart cities.
CE5316QB	Water Resources Modeling for Urban Catchments	2	Sustainable Climate Resilience	-	-	This course introduces CE students to practical issues in the process from data collection to modelling rainfall to runoff. The focus will be on urban environments where the impact of flooding is magnified due to high population density. Students will collect, clean and use data to setup and run a basic catchment rainfall-runoff model. The understanding gained will provide students with a greater appreciation in the methodology used to translate fundamental knowledge to practical real-world situations specifically floods in an urban catchment.
CE5317QA	Eco-hydrology	2	Sustainable Climate Resilience	-	-	This course introduces biophysical principles regulating exchanges of water, energy, and elements in the soilplant-atmosphere continuum and their mathematical descriptions. The presented material will address different spatial scales from a single tree up to global scale and different temporal scales from minutes to decades. Essential features of plant microclimate and plant hydraulic transport, soil hydrology, and terrestrial ecology will be introduced. The course will also provide the foundations to carry out numerical simulations of water and carbon fluxes with state-of-the-art models.
CE5317QB	Nature Based Solutions for Coastal Protection	2	Sustainable Climate Resilience	-	-	This course focuses on marine and coastal environments with an emphasis on salt marshes, seagrass, kelp, mangrove, and coral reef habitats. We will study the carbon and nutrient cycles of these ecosystems and their interaction with the surrounding water environments. We will also discuss how these ecosystems could help mitigate the impact of sea-level rise and climate change. The presented material will cover 1) the role of blue carbon for climate change mitigation targets; 2) the role of aquatic vegetation in coastal erosion; 3) successes and failures of restoration projects.
CE5318	Decision-making for Climate Adaptation	4	Sustainable Climate Resilience	-	-	Climate adaptation projects are implemented in complex socioeconomic and environmental systems and have long life spans, resulting in many uncertainties. Under such conditions, conventional approaches to infrastructure planning and development may not lead to optimal solutions. This course introduces methods and tools for decision-making for climate adaptation. Besides conventional methods, such as cost benefit analysis and multi-criteria analysis applied to climate adaptation infrastructure, the focus will be on flexible solutions that can adapt to changing conditions and new information, such as adaptive pathways and real options analysis. This knowledge is relevant to evaluate many future civil and environmental infrastructure projects.

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CE5319	Circular Economy for Sustainable Development	4	-	-	-	The world is seeing a rising popularity of circular economy that adopts the concept of reduction, reuse, recycling and recovery of materials in production, distribution and consumption processes. This course provides an introduction to circular economy and its application in sustainable development. A list of ubiquitous materials are covered, such as water, plastic, glass, construction materials & wastes. Each topic will look at global best practices and local context. Guest lecturers from public agencies will be invited to talk about Singapore's sustainable urban planning. Student will learn the principles and tools to assess the circularity and sustainability of given cases.
CE5721QA	Coastal Waves and Wind	2	Sustainable Climate Resilience	-	CE5307 / OT5201	Waves and wind are key coastal processes, and it is important to understand their underlying mechanics for coastal protection, which is crucial for low-lying countries such as Singapore. This course covers the fundamental concepts of waves and wind essential for an engineer working on coastal protection. Topics include regular wave and random wave theory, wind characteristics, and storm surge which is the phenomenon of the rise in water level due to wind pressures.
CE5721QB	Coastal Environmental Loads	2	Sustainable Climate Resilience	-	CE5307 / OT5201	Waves and wind loading affect all coastal structures. It is important to understand and be able to predict this loading behaviour during the design of coastal defences. The course will focus on the potential and diffraction theories on wave loading. It will cover the loading effect of waves on small and large coastal structures, including the spectral analysis of random wave forces and the prediction of gust wind forces.
CE5010QA	Finite Element Concepts & Applications	2	Structural Engineering	-	CE4257 / TCE4257 / CE4257A / CE5010A	This course equips participants with the fundamentals of finite element principles to enable them to understand the behavior of various finite elements and to be able to select appropriate elements to solve physical and engineering problems with emphasis on structural and geotechnical engineering applications. The course is targeted at practicing engineers involved in application of the finite element method in civil engineering problems.
CE5010QB	Finite Element Analysis for Civil Engineering	2	Structural Engineering	CE5010QA	CE4257 / TCE4257 / CE4257B / CE5010B	This course is a continuation of CE5010QA to further equip participants with relevant knowledge and skills in using finite element method (FEM) in civil engineering applications. 3D solid elements for stress analysis will be covered as extension of 1D and 2D elements covered in CE5010QA. A generalised formulation, namely the weighted residual method, will be covered to solve problems beyond stress analysis (such as seepage, flow and heat transfer problems). Practical issues in modelling civil engineering structures will be discussed. The course is targeted at practicing engineers involved in application of the finite element method in civil engineering problems.
CE5509QA	Advanced Structural Steel Design	2	Structural Engineering	Background in Structural Steel Design	CE5509 & CE5509A	The primary objective of this course is to equip participants with advanced design knowledge and skills on steel structures. This course provides participants with approaches in designing structural components and buildings using steel and its use to enhance buildability and productivity in prefabricated prefinished volumetric construction (PPVC). The participants will acquire fundamental knowledge and skills to perform design for structural elements and ensure the stability of steel structures. This enables the participants to conceive a safe and economical structural system using steel to improve productivity for the construction industry of Singapore. The course is targeted at practicing engineers and postgraduate civil engineering students with a keen interest on structural steel design including the design for manufacturing and disassembly (DfMA) using PPVC technology.
CE5509QB	Design of Composite Steel and Concrete Structures	2	Structural Engineering	CE5509QA	CE5509 & CE5509B	The primary objective of this course is to equip participants with sufficient design knowledge and skills on steel-concrete composite structures in their engineering career. This course provides participants with fundamental approaches in designing structural steel-concrete components and buildings. The participants will acquire fundamental knowledge and skills to perform structural design for composite beams, slabs, columns, joints, multi-storey buildings. This enables the participants to conceive a safe and economical structural system. The course is targeted at practicing engineers, post-graduate civil engineering students and those with a keen interest on structural design.

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CE5510QA	Advanced Structural Concrete Design	2	Structural Engineering	-	CE5510 & CE5510A	The objective of this course is to equip participants with fundamental approaches in designing structural concrete components and systems. The participants will learn refined methods in the design for action effects and for deflection and crack control, and in the structural detailing of concrete members. The course is targeted at civil engineers and those with a keen interest on advanced structural concrete design.
CE5510QB	Rational Design of Structural Concrete Systems	2	Structural Engineering	CE5510QA	CE5510 & CE5510B	The objective of this course is to equip participants with design knowledge and advanced skills in designing flat slab and irregular slab systems, slender columns, and non-flexural members such as deep beams, corbels, dapped beams and beams with openings. The course is targeted at civil engineers and those with a keen interest on advanced structural concrete design.
CE5513	Plastic Analysis Of Structures	4	Structural Engineering	-	CE5885A	This course provides students with basic knowledge on the theory of plasticity and their application for analysis and design of civil engineering structures. The topics covered include basic concepts of plasticity; the plastic hinge; tools used in plastic analysis and design; plastic design of beams, portal frames and multi-storey buildings, and computer methods for analysing large scale framework. Students are taught to deal with general inelastic problems of frames including computer applications and numerical formulation. The course of specialized context targets at undergraduate and graduate students in research or engineering practices relating to structural analysis and design.
CE5515	Structural Health Monitoring	4	Structural Engineering	-	-	Continuous and ad-hoc structural health monitoring to obtain information of the structural integrity and damage allows engineers to pre-empt structural failures by carrying out preventive maintenance and thus reducing service downtime and avoiding potential catastrophe due to undetected structural degradation. Digitalisation of civil structures with integrating sensor systems together with identification algorithms allows the performance and health of the structures to be monitored in real-time to ensure safe and efficient operation. This course provides an overview of the state-of-the-art technologies and approaches implemented in civil structures in the field as well as cutting-edge techniques still under research and development.
CE5516QA	Structural Stability Concepts & Applications	2	Structural Engineering	Background in structural matrix analysis	CE5516 / CE4258 / TCE4258 / CE5516A	The primary objective of this course is to equip participants with the basic principles and concepts of structural stability for the analysis of civil engineering structures. Students will learn stability characteristics and design steel frames for local and global stability according to Eurocode 3 (EC3). The topics covered include general principles of stability, buckling of column, beamcolumn and frames. Students will also be taught how to deal with general stability problems of frames using computer applications and numerical formulation. The course is targeted at post-graduate and senior under-graduate civil engineering students with a keen interest on stability analysis and design.
CE5516QB	Structural Dynamics Concepts & Applications	2	Structural Engineering	Background in structural matrix analysis	CE5516 / CE4258 / TCE4258 / CE5516B	This course is targeted at practicing civil engineers involved in planning, analysis and design of buildings. The primary objective of this course is to equip participants with fundamental understanding and technical knowledge needed for the dynamic analysis and design of buildings. The philosophy and concepts taught are applicable to onshore and offshore structures subjected to loadings resulting from sources such as earthquake, wind, waves and blast. Students will have to complete the dynamic analysis of a multi-dimensional structure using a software used in engineering practice. The course is targeted at post-graduate and senior under-graduate civil engineering students with a keen interest on dynamic analysis and design.
CE5604	Advanced Concrete Technology	4	Structural Engineering	-	TCE5604	This course provides students with in-depth knowledge on the role of constituent materials of concrete such as cements, mineral admixtures, and chemical admixtures and their interactions that affect properties of fresh and hardened concrete. It also provides students with in-depth knowledge on concrete response to stresses, time-dependent deformations, and durability of concrete exposed to severe environments. The course discusses the basic considerations and design philosophy for performance-based design of concrete mixtures and production of concrete. It also discusses the progress in concrete technology and the latest development on high-strength, high-performance, lightweight, and self compacting concrete. Sustainable development in construction industry and use of recycled aggregates and other recycled materials will be discussed as well. The course is targeted at post-graduate and final year undergraduate students who will gain knowledge from the course to complement their skill in structural design and to prepare them for their career as professional engineers.

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CE5610QA	Concrete and Cementitious Composites	2	Structural Engineering	-	CE5610 & CE5610A	The main objective of this course is to cover advanced topics in concrete and cementitious composites. Focus will be placed on special cement-based materials that are fast replacing traditional normal density, low strength concrete in the construction industry, especially precast and repair and retrofit. More specifically special concretes and special processes and technology for particular types of structures are discussed. Case studies will used to illustrate construction and sustainability issues. Use of concrete and cementitious composites in a number of applications will also be covered.
CE5610QB	Repair and Retrofit of Concrete Structures	2	Structural Engineering	-	CE5610 & CE5610B	The primary objective of this course is to equip civil engineers with sufficient knowledge and skills on the durability of concrete structures and the basic principles and concepts of repair and retrofitting. Various factors affecting durability of concrete will be dealt with including non-destructive tests to assess durability. The course also emphasizes the technological and application aspects in the assessment and retrofit of concrete structures including causes of deterioration and various in-situ and nondestructive tests. The course is targeted at practicing civil engineers and those with a keen interest in durability of concrete, assessment of concrete and retrofitting of concrete structures.
CE5611QA	Advanced Prestressed Concrete Design	2	Structural Engineering	-	CE5611 & CE5611A	The course caters to industry needs pertaining to the design of prestressed concrete to Eurocode 2, which is prevalent in practice but not dealt with in many undergraduate programmes. The course is suitable for practicing engineers. The main course contents cover Basic Prestressed Concrete Design, Prestressed Concrete Compression & Tension Members, Prestressed Composite Beams, Prestressed Concrete Continuous Beams and Prestressed Concrete Slabs.
CE5611QB	Precast Structural Concrete Design	2	Structural Engineering	-	CE5611 & CE5611B	The primary objective of this course is to equip civil engineers with sufficient design knowledge and skills on precast structural concrete both for their further education and for their future engineering career. This course provides participants with fundamental approaches in designing precast concrete components and structures. The participants will acquire fundamental knowledge and approaches to section analysis and design, design of connections, floor diaphragm action, precast frame structures and precast components. The course is targeted at practising civil engineers and those with a keen interest in precast concrete technology.
CE5805QA	Construction Productivity Analytics	2	Infrastructure Digitalization & Management	-	CE5805 & CE5805A	In a project, the selection of construction method and equipment are important considerations that can affect project productivity. In this context, this course gives an overview of construction planning with particular considerations for equipment selection and fleet size determination. It will examine productivity enhancement frameworks and technologies. Finally, the concepts of simulation to analyse and improve productivity will be taught via a hands-on application.
CE5805QB	Design for Manufacture and Assembly	2	Infrastructure Digitalization & Management	-	CE5805 & CE5805B	Design for Manufacture and Assembly (DfMA) aims at ease of manufacture and assembly efficiency in order to increase overall productivity in construction. With this design approach, waste can be eliminated, construction time can be reduced drastically and cost can be lowered. This course discusses the concepts of constructability and examines in detail the principles of DfMA from the perspective of manufacture and assembly. It also covers logistical considerations to realise just-in-time production and delivery. BIM and digital technologies will also be discussed.
CE5806QA	Advanced Construction Planning & Control	2	Infrastructure Digitalization & Management	-	CE5806 & CE5806A	This course aims to equip students with the concepts, methodologies and tools to successfully control a project on site. In particular, they will learn to organise, plan and schedule a project for execution, and put in place controls for schedule and cost. They will learn advanced planning functions that include schedule compression, delay analysis and risk management.
CE5806QB	Lean Construction	2	Infrastructure Digitalization & Management	-	CE5806 & CE5806B	This course aims to equip students with the concepts, methodologies and tools to successfully manage a project on site while achieving higher productivity. Lean construction concepts will dramatically improve performance by reducing waste, cost and increase value. Project plans can be made reliable with commitments from stakeholders. Students will learn to diagnose a construction process and devise strategies to increase productivity.
CE5807QA	Digital Technologies for Construction	2	Infrastructure Digitalization & Management	-	CE5807 & CE5807A	To realise the Integrated Digital Delivery (IDD) concept, a paradigm shift within the construction industry must take place. Embracing Digital technology is necessary as it is rapidly changing the face of construction. The objective of this course is to introduce students to the current state-of-the-art in terms of digital technology implementations in building and construction. This course will also introduce students to several data analytic techniques often used in conjunction with these digital technologies, to improve decision making on site.

Course Code	Course Title	Units	Specialisation	Pre-requisite/ Co-requisite	Preclusion	Description
CE5807QB	Integrated Construction Logistics	2	Infrastructure Digitalization & Management	-	CE5807 & CE5807B	Digital transformation allows the construction industry to overcome challenges such as supply chain disruptions and delays in projects. Under the Construction Industry Transformation Map (ITM), Integrated Digital Delivery (IDD) involves the use of digital technologies to integrate work processes and connect stakeholders throughout the project lifecycle. The technologies of Industry 4.0 support this effort. This course provides learners with an overview of the industry transformation efforts and introduces technologies such as cyber-physical systems, sensors, internet of things (IoT) and artificial intelligence (AI). In addition to lectures and projects, there would be sharing by industry practitioners to facilitate learning.
CE5808QA	Virtual Design in BIM	2	Infrastructure Digitalization & Management	-	CE5808 & CE5808A	Building Information Models are central repositories of data and information about the building over its lifecycle. The objective of this course is to enable participants to understand the technology underpinning building information models, and the different data standards involved. This will allow students to create, manipulate and update building information models at the data level. The specific topics will include Algorithmic Thinking, object-oriented modelling, digital design ("Computational BIM") and understanding of current data standards used in information modelling within the industry.
CE5808QB	Advanced Digital Construction	2	Infrastructure Digitalization & Management	-	CE5808 & CE5808B	Virtual Design and Construction (VDC) features the integration and management of multi-disciplinary Building Information Models (BIM). The goal of the course is to enable participants to understand the business value of VDC, and how it can be successfully applied to current infrastructure and building projects. Specifically the objective of the course is to expose participants to the core principles and methodologies of VDC. These include topics on Integrated Project Delivery, BIM quality, Lean Design Management, and Process Mapping.
CE5809	Management and Economics of International Construction	4	Infrastructure Digitalization & Management	-	CE5804 & CE5603	Modern engineering infrastructure systems are becoming increasingly complex. This course equips students with the analytical methods and methodologies to evaluate and manage such systems with consideration in an international market setting. The course also considers BOT and PPP procurement instruments and project financing. Specific topics include project feasibility, risk management, international markets, engineering economics, project financing, value management, as well as procurement management.