UNIVERSITY OF WOLLONGONG IN DUBAI

Bachelor of Engineering (Honours) - Civil Engineering

The Bachelor of Engineering (Honours) degree is a four year degree with a common first year where you will learn more about engineering and its different fields before deciding which discipline to study. The common first year provides you with sound fundamentals in mathematics, statistics, physics, chemistry, computing, engineering science and communication, mechanics, materials and fluids. You then focus on your chosen major study from second year.

To qualify for award of the degree of Bachelor of Engineering in this major, a candidate shall accrue an aggregate of at least 192 Credit Points (cp), which includes two general electives chosen from the general education subjects, in addition to one more general education subjects, for a total of 198 (cp). In addition, completes the professional experience subject ENGG454. Students are also required to accrue an overall weighted average mark (WAM) of 50%. The degree consists of core subjects, major subjects, thesis, electives and general education subjects details of which are below:

Year 1

Engineering Computing and Analysis

This subject teaches algorithm design and computer programming using MATLAB. Students will develop a systematic approach to analyse engineering problems and create algorithms that solve real-world problems. Topics will include: problems solving techniques; algorithm design; data types and operators; conditional and repetitive control flow; file access; functions; data visualisation; code optimisation; arrays/matrices; and vectorisation. Students will also focus on computational tools to solve engineering problems such as kinematics of rectilinear and curvilinear motion.

Fundamentals of Engineering Mechanics

In this subject student will explore fundamental laws of motion and their application to the analysis and design of simple structures. Students will undertake a series of design and build projects to see the effects of concepts of mechanics in real structures. Working in design teams, students will also explore the professional responsibilities of engineers in terms of accountability, liability and sound design and analysis techniques.

Materials in Design

In this subject student will explore the interrelationships between materials structure, properties, processing, application and lifecycle. Students will apply materials science and lifecycle analysis to develop solutions to engineering problem that are optimised for sustainability. Students must consider both economic and environmental impact in the identification and selection of appropriate materials in engineering design.

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Electrical Systems

ENGG104 introduces real-world electrical systems. The subject teaches fundamental electrical concepts: change, current, voltage, resistance, capacitance, inductance, energy and power. The subject introduces theorems to simplify AC and DC circuits through analysis and simulation. The subject also links the fundamental concepts to practical engineering applications such as motors and generators. The laboratory component covers measurements using electrical components and equipment, designing basic circuits, as well as report writing.

Engineering Design for Sustainability

In this subject, students will draw together engineering principles covered in other subjects to develop context-appropriate solutions to engineering challenges. Students will work in teams undertaking investigation, concept development, and detailed design that demonstrates innovative and creative thinking. Students must consider the technical, social, economic and environmental aspects of a design problem to produce solutions that are likely to be workable in the real world.

Foundations of Engineering Mathematics

The subject consists of two strands, Calculus and Linear Algebra. The Calculus strand covers differential calculus and introduces integral calculus. The Linear Algebra strand covers matrices, determinants and applications of these in the sub-topic of vector geometry. All of these are presented with accompanying examples from various engineering disciplines.

Essentials of Engineering Mathematics

The subject consists of two strands, Integral Calculus with applications and Series. The Integral Calculus strand presents a number of analytical and numerical integration techniques plus applications of integration to find areas, volumes of revolution and solve differential equations. The Series strand covers techniques for finding limits, determining the convergence of series and leads into Taylor series. All of these are presented with accompanying examples from various Engineering disciplines.

Physics for Engineers

Vectors and their applications; an introduction to the physical laws of electricity and magnetism, leading to an explanation of the generation of electromagnetic waves and some basic ideas in communication theory. Electric charge and Coulomb's law, electric fields, potential differences, capacitance, dielectrics and relative permittivity, electric current, resistance, Ohm's law, superconductivity, DC circuits and Kirchhoffs laws, magnetic fields and forces, electromagnetic waves and the EM spectrum, carrier waves, modulation and bandwidth. Waves; reflection and refraction; interference; diffraction; polarization; optical instruments; quantum physics; waves and particles; atomic physics; the Bohr atom.

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Year 2

Advanced Engineering Mathematics and Statistics

MATH283 is a subject for Bachelor of Engineering (Honors) students. The subject consists of two parts, Advanced Engineering Mathematics and Statistics. Each part is worth 50% of the final mark. Advanced Engineering Mathematics deals with new techniques, including partial differentiation, multiple integration, introduction to special functions (the gamma, beta and error functions), Laplace transform, and Fourier series; Statistics introduces statistical computing, and to basic statistical techniques, including mathematical models for describing variation in experimental situations

Mechanics of Solids

Stress on a section, concept of stress-strain relationship and Hooke's Law. Torsion of shafts and hollow sections. Problems in bending and stress of beams. Analysis of plane stress and plane strain, combined stresses. Elasticity and plasticity for metals, and inelastic behavior of nonmetals. Failure theories. Beam deflections and simple column buckling. Thermal stresses and strain energy concept. Experimental techniques. Recommended minimum preparation is Engineering Mechanics (Statics), Engineering Mathematics and Engineering Materials.

Engineering Fluid Mechanics

This subject is designed to introduce elementary fluid mechanics concepts for biomedical, civil, environmental, materials, mechanical, mechatronics and mining engineers. The topics include fluid properties, hydrostatics, manometry, Bernoulli's, mass, energy and momentum equations and their applications, dimensional analysis, fluid flow in pipes, pipe friction losses and fluid flow measurements. The lecture components will be complemented with workshops and laboratory classes. This subject intends to provide a working knowledge to solve simple fluid flow problems in the various branches of engineering. Students are assumed to have knowledge of 1st year engineering mathematics.

Chemistry for Engineering

The 103 course introduces basic chemistry through topics applicable to engineering courses. Fundamentals: nomenclature and stoichiometry. Atomic theory, bonding and structure. Properties of matter. Reactions: thermochemistry, thermo dynamics, chemical equilibria, acid base equilibria and kinetics. Introductory organic chemistry. Environmental chemistry: pollution and pollution control. Electrochemistry: redox, galvanic cells, electrolysis and corrosion. Chemical basis of engineering materials such as metals, semiconductors, polymers, fuels, adhesives, concrete.

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Engineering and Environmental Geology

This subject introduces geology applied to engineering. Topics include rock-forming minerals; petrology and physical properties of igneous, sedimentary and metamorphic rocks; weathering and erosion; basic geological structures and identification of unstable rock masses; geological mapping and three-point problems; geological controls on groundwater flow and chemistry; geophysics; site investigations; and the relationship between geology and various engineering works such as excavations, tunnels, dams and foundations.

Surveying

Basic concepts - Australian map grid, Integrated survey grid, Australian height datum, control surveys, locating position, errors in measurement, units in surveying and significant figures. Measuring distances, reduced levels and angles. Determining position - traversing, global positioning systems and plane rectangular coordinates. Earthworks and volumes. Setting out - basic procedures, setting out curves, trenches, sewers, buildings and slope stakes for road grade. Introduction to underground surveying. Computer assisted data reduction. In addition to theoretical instruction, fieldwork assignments will be undertaken in electromagnetic distance measurement, traversing, levelling, curve ranging, staking a slope, and, for mining students, practical surveying in an underground environment.

Computer Modelling in Civil Engineering

The subject will be based around the design and construction of a typical framed building. Students will be introduced to Building Information Modelling (BIM) through sample files which they will edit and manipulate before creating their own prototype. Structural engineering and building construction terminology will be covered in sufficient detail for students to be able to understand architectural and constructions drawings and to produce structural models of the building. A simplified treatment of Australian loading codes will be delivered along with structural design charts. Frame analysis software will be used to derive structural forces and allow for sizing of beams, columns, floor slabs and footings. The structure will be examined using a number of different assumptions. Students will work in small teams to produce an integrated building design by the end of the session.

Construction Materials

The subject is designed to introduce the properties and use of the more common materials in modern construction practice. Topics will include: Concrete - Properties of concrete; structure and composition; cements; mix design; durability; high performance concrete; concrete manufacture Steel - Properties of steel with particular reference to brittle fracture, fatigue, corrosion and fire damage Alternative materials - timber; masonry; polymers; aluminum; composites.

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Year 3

Structural Design 1

Introduction to structural design, dead and live loads. Review of limit states design. Design of reinforced concrete structural elements according to AS 3600. Strength and serviceability of reinforced concrete beams and one-way slabs. Design of reinforced concrete columns for strength and stability. Design of steel beams and girders to AS 4100. Design of tension and compression members for trusses. Introduction to local and lateral buckling. Design of bolted and welded steel connections.

Structures 1

Statically determinate and indeterminate trusses, beams and frames. Deflection of trusses, beams and frames. Structural analysis methods, for example: flexibility, stiffness methods, slope deflection and moment distribution. Influence lines.

Structural Design 2

An introduction to wind and seismic loads. Design of reinforced concrete structures including the serviceability and strength design of reinforced concrete two-way slab and flat plates for multistory buildings, reinforced concrete footings and reinforced concrete retaining structures. An introduction to the design of prestressed concrete beams for serviceability and strength for both buildings and bridges.

Geomechanics

Soils and rocks - differences and similarities; cohesionless and cohesive soils; behavior of intact and jointed rock masses; weight-volume relationships; particle size distribution; index properties of soils; soil classification; soil compaction and compressibility; mechanical properties of rock. Some topics will be presented in a laboratory environment. Pore water pressures and effective stress concept; permeability of soil and hydraulic properties of rock masses; groundwater flow; seepage theory; flow nets. Shear strength of soils and rock masses, total and effective stress parameters, Mohr-Coulomb criterion; Hoek and Brown failure; sliding on planes of weakness. Application of elastic theory for calculating stresses and displacements within soil or rock masses. Stability analysis of soil and rock slopes; stabilization methods.

Hydraulics and Hydrology

Open Channel Hydraulics - uniform flow; gradually varied flow; changes in channel cross section; hydraulic structures; rapidly varied flow. Flood Hydrology - data collection and analysis; flood frequency; rainfall intensity-frequency-duration relationships; unit hydrograph; design flood estimation; flood routing in rivers and storage reservoirs; water distribution systems.

Construction

The subject is designed to provide students with detailed knowledge of construction with regard to both surface and underground structures, including construction techniques, stability and maintenance aspects. The following subject material will be covered: Plant and equipment in Civil Engineering practice; Construction processes and quality control; Tunnelling in soft ground and rock; Coffer dams and caissons; Harbour works; Dewatering and grouting methods; Performance monitoring and observational design; underpinning and restoration techniques; formwork and scaffolding. The lectures and tutorials will be complemented with practical project work and a field trip.

Principles of Foundation Engineering

One-dimensional theory of consolidation, primary and secondary consolidation; normally consolidated and over consolidated soils; settlement analysis. Relationship between principal stresses at failure, importance of drainage conditions in soils, fully undrained conditions for saturated soils; drained and undrained shear strength of cohesive solids, behavior of partially saturated soils. Overburden and lateral stresses, active and passive pressures, Rankine's earth pressure theory, Coulomb's wedge theory, geotechnical aspects of retaining walls, drainage of backfill. Bearing capacity of foundations; shallow footings and rafts, pile foundations, contact stress and subgrade reaction; use of elastic theory for stress and settlement calculation in soils.

Year 4

Managing Engineering Projects

This subject aims to provide students with the essential managerial skills and knowledge required to effectively manage engineering projects. Students will develop proficiency with the application of a range of concepts, techniques and analytical tools relating to the knowledge areas of project scope, resources, time, cost, risk and contracts management. Additionally, the subject introduces students to the ongoing challenges around the management of stakeholder expectations, various technical and social interfaces and the impact of organizational and environmental factors on successful project delivery.

Fundamentals of Construction Management

Introduction to risk management and ongoing management issues with a focus on the development of a credible business plan design with identification of potential risks. Within the site construction management context, students will develop skills in planning and scheduling, construction economics, construction safety and equipment maintenance. Students will be introduced to analytical tools for improving productivity and performance applied to the project scope, time, cost, risk and contractual issues. Introduction to BIM (Building Information Modelling) concepts and processes and how they interact with construction industry. Students will develop the ability to reads plans/blueprints and learn how to visualize the structural components relationships between 2D and 3D representations with the aid of software tools. Incorporating BIM in the context of estimations of quantities and cost and construction analysis and design.

Civil Engineering Design

Major Civil Engineering design, which will cover an integrated project incorporating geotechnical, hydraulic, structural and transport engineering.

Thesis A

All students must complete a 12-credit point thesis (ENGG452) normally over a period of two sessions. Students are expected to spend at least 336 hours on the 12-credit point thesis. The thesis is a core element of the degree in each engineering course. The knowledge and skills acquired in the design, experimentation, analysis, management and communications aspects of the course are brought together in an individual project undertaken by the student under the guidance of an academic supervisor. Individual disciplines will advise further requirements at the start of the thesis.

Choose 2 Technical Electives

Applied Geotechnical Engineering

Models of soil behavior, stress paths in soil mechanics, total and effective stress paths. Stress strain behavior of different types of soil under drained and undrained conditions; strain-softening; peak, softened and residual shear strength of cohesive soils; pore pressure co-efficient A and B and their use in practical problems. Soil behavior under earthquake conditions, the phenomenon of liquefaction. Comparison of laboratory and field testing for geotechnical investigation; uncertainties in geomechanics.

Sustainable Road & Transport Engineering

This subject addresses the mechanics, analytical approaches, and design principles associated with road and infrastructure. The subject covers traffic loadings, rigid and flexible pavements, and trends in road and rail transport technologies. Topics are addressed with a particular focus on environmental, economic and social sustainability in design and selection of materials.

Applied Finite Element Analysis for Civil Engineers

Use of engineering applications software, including structural and geotechnical mechanics, using finite element programs for stress, stability, and dynamic analysis. Discrete simulation. Depending on the availability of software other applications may be utilized. Problems will be selected from various areas in engineering.

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*General Education Subjects**

*Can be taken in any year of your degree

Choose 1 UAE Studies Subject

Urban Sociology

The societies and places in which we live are very complex, and the interactions of individuals, as well as social institutions, have a direct impact on the life path we take. This course provides an engaging and accessible introduction to urban sociology and the study of cities, with particular focus on the experience of the UAE and Dubai. We'll examine a number of substantive urban topics, including but not limited to the growth of cities and urban spaces in the UAE, sustainable development and practices, and the 'built' environment.

Public Health

This course will introduce Public Health as an interdisciplinary science concerned with topics central to the population of U.A.E and on a wider scale of GCC region with regard to their physical, mental, and social well- being. The course focuses on current pertinent public health problems, assessing causation and examining intervention and management strategies at personal, social, and organizational levels.

UAE and International Relations

This course offers an overview of the UAE's rapidly emerging significance and its increased roles in global networks of international relations and diplomacy. Within that overview, the course examines the internal dynamics of the UAE, in particular, the priorities that emerge from a specific workforce dependency, a construction and tourism industry that looks 'East' as much as it does 'West'. Thus the new 'Look East' policy complements the country's historical partnership with the Western states. With the expansion of its global ties and relations, the UAE also becomes more sensitive to transnational issues, such as immigration, fluctuations in international markets or terrorism.

Society and Environment – Resources, Challenges, Futures

This subject aims to provide an understanding of relations and interactions between society and environment, including impact of societies on the Earth and its processes. Topics covered include the agricultural, industrial and urban revolutions; governance of environments; Indigenous land

management; climate change; sustainability; and environmental impacts in the context of the Anthropocene.

Take 1 Arabic Language Subject or Challenge Test

Arabic Language

Language is key to everything we do. From verbal communication and the way we talk, to non-verbal communication and the emojis we use in our text messages, to the visuals we use to construct compelling visual stories, language is how we communicate. Living, studying and working the UAE, having a basic understanding of Arabic language can give you a huge competitive advantage. This introductory subject provides some of the basics of Arabic language, and you'll leave this subject able to communicate on a basic, conversational level.

Compulsory General Education Subject

Muslim Societies Across the Ages: Tradition, Secularism & Modernity

This course aims to provide students with critical thinking perspectives about the relationship between history, religion and culture, in this case, the formation of Islamic culture(s). A sociological introduction to the study of Islamic culture will introduce students to the emergence of Islam in its 7th century historical context, its relationship to the other monotheistic traditions of the region, its growth into the dominant cultural paradigm of the Near East by the 9th century, alongside its impact and contribution to key fields of medieval science and knowledge. A historical approach will help students acquire familiarity with key Islamic texts, institutions, concepts of authority, traditions of jurisprudence and spirituality, artistic expressions, as well as milestones in Islamic history. The course wraps up with a discussion of issues central to contemporary debates relating to Islamic culture, such as identity, gender, multiculturalism, pluralism, secularism and religiosity.