THE UNIVERSITY OF HONG KONG

Master of Science in Engineering in Innovative Design and Technology [MSc(Eng)(IDT)]

Course Fee: HK$216,000 for the whole programme (72 credits) – updated on 5th October 2021

Programme Learning Outcomes

University Educational Aims (UEAs)	Proposed MSc(Eng)(IDT) PLOs
UEA1. Critical intellectual enquiry and acquiring up-to-date knowledge and research skills in a discipline / profession.	**PLO1** On successful completion of the curriculum, students should understand the fundamental concepts and theories of innovative design with relevant technology, and acquire specialised knowledge to solve problems that are critical to future growth of industry and business.
UEA2. Application of knowledge and research skills to practice or theoretical exploration, demonstrating originality and creativity.	**PLO2** On successful completion of the curriculum, students should be able to apply advanced knowledge, analytical skills and reasoning in interdisciplinary fields between innovative design, technology and other appropriate disciplines.
UEA3. Tackling novel situations and ill-defined problems.	**PLO3** On successful completion of the curriculum, students should be able to apply and integrate of interdisciplinary knowledge and skills to identify and tackle practical problems, and develop innovations using appropriate tools and techniques.
UEA4. Collaboration and communication of disciplinary knowledge to specialists and the general public.	**PLO4** On successful completion of the curriculum, students should demonstrate the ability to present effectively, initiate innovative ideas with other specialists and use specific technical terminology.
UEA5. Awareness of and adherence to personal and professional ethics.	**PLO5** On successful completion of the curriculum, students should be able to demonstrate independent and critical thinking ability and appreciate the ethical issues and concerns relevant to the discipline.

UEA6. Enhancement of leadership and advocacy skills in a profession.	**PLO6** On successful completion of the curriculum, students should be able to develop a critical awareness of current issues in the global market, and inculcate leadership, professional ethics and competence in entrepreneurship and relevant interdisciplinary fields.

[This syllabus is applicable to students admitted to the curriculum in the academic year 2022-23 and thereafter]

Definition and Terminology

Discipline Course – any course on a list of courses in the discipline of curriculum, which a candidate must pass
at least a certain number of credits as, specified in the Regulations.

Elective Course – any course on a list of courses in the discipline of curriculum, which a candidate must pass at least a certain number of credits as, specified in the Regulations.

Capstone Experience – a 12-credit project, which is an integral part of the curriculum focusing on the integration and application of knowledge, and skills that candidates have acquired throughout their studies.

Curriculum Structure

Students are required to complete not fewer than 72 credits nor more than 84 credits.

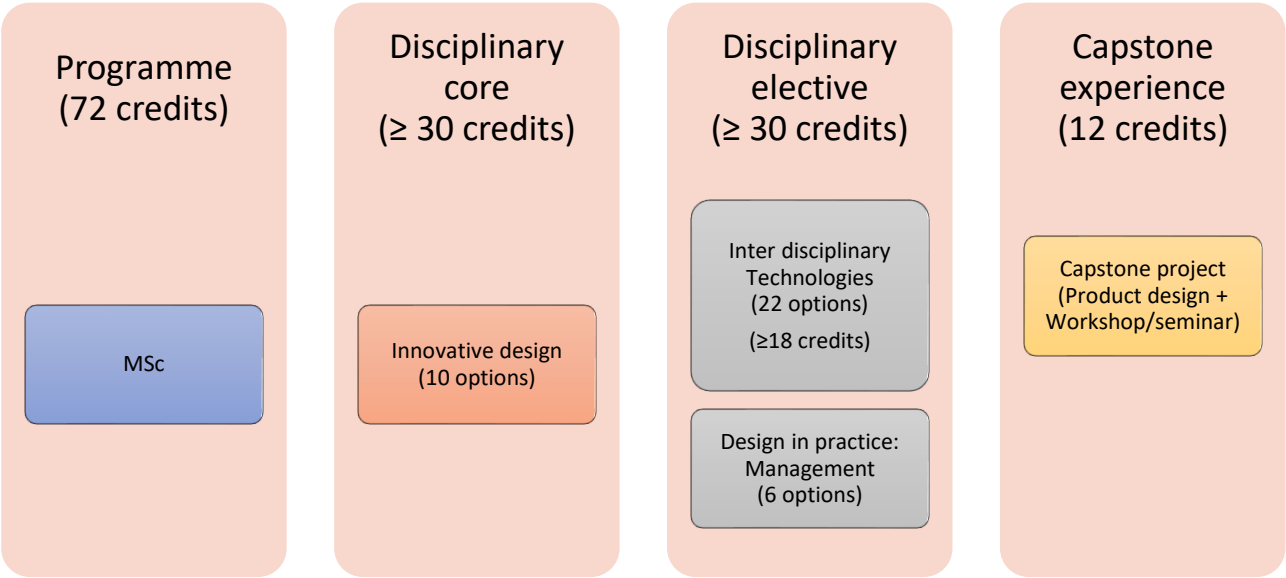
Course Category	No. of Courses	No. of Credits	Remarks
Disciplinary core courses	≥ 5	≥ 30	At least 5 courses under List-A
Discipline elective courses	≥ 5	≥ 30	• At least 3 courses under List-B • Any number courses in List-C
Capstone experience	Project	12	• Innovative design with demonstrable prototype. Space and facilities can be supported by different departments, Innovation Wing (Pending) or other approved organisations. • ≥ 15hrs workshop / seminar offered by different departments, Innovation Academy, Science park, and/or approved organisations. The workshop / seminar will involve different areas, e.g. new technologies, intellectual property law, ethical issue, business management, etc.
	Total:	72	Not fewer than 72 credits nor more than 84 credits

38 courses are offered in this programme (excludes capstone project). The number of courses offered will be subjected to biyearly reviews to keep up with the latest development and challenge faced by the society.

Type	Course area	Number of courses offered	Inter disciplinary	
			Faculty	Course code
Core	Innovative design	10	Faculty of Engineering	IDAT, COMP, MECH, IELM
Elective	Technology	17	Faculty of Engineering	IDAT, COMP, MECH, IELM, ELEC, MEDD, CIVL
		2	Faculty of Education	MITE

		3	Faculty of Architecture	URBA, RECO
	Management	6	Faculty of Engineering	COMP, MECH, ELEC
	Total	38		

With the proposed programme structure, students are ensured to study at least 5 and 5 courses under the disciplinary core and disciplinary elective respectively.



CURRICULUM

List-A Disciplinary core courses (Innovative Design)				
Count	**Course code**	**Course** (all 6 credits)	**Prerequisites**	**Study level (Advanced)**
1	IDAT70XX	Innovative design and R&D principle	Nil	
2	IDAT70XX	Mechatronic systems design	Nil	
3	IDAT70XX	UAV design, navigation and control	MECH7010 Good programming skills with MATLAB, C / C++, hands-on experiences	√
4	IDAT70XX	Advanced technologies and materials for product development	Nil	
5	IDAT70XX	Computer programming product development and application	Nil	

6	IDAT70XX	Function design, aesthetics design, manufacturing and intellectual property law	Nil	
7	COMP7506	Smart phone apps development	Basic programming knowledge, e.g. C++ or Java	√
8	MECH6034	Computer aided product development	Nil	
9	IELM6030	Ergonomics	Nil	
10	COMP7503	Multimedia technologies	Nil	

List-B Disciplinary elective courses (Technology) *(Select at least 3 courses)*				
Count	**Course code**	**Course** (all 6 credits)	**Prerequisites**	**Study level (Advanced)**
1	MECH6010	Service behaviour of materials	Nil	√
2	MECH6046	Microsystems for energy, biomedical and consumer electronics applications	Nil	√
3	MECH6047	Finite element analysis in mechanics	Nil	√
4	MECH7010	Contemporary robotic	Nil	√
5	IELM7021	Computational optimisation and intelligent analytics	Nil	√
6	IELM7022	Advanced cyber-physical systems	Nil	√
7	IELM6034	Operational research techniques (2nd semester)	Nil	
8	COMP7103	Data mining	Nil	√
9	COMP7606	Deep learning	COMP7404 Computational intelligence and machine learning (Knowledge of algorithms, calculus, linear algebra, and programming would be an advantage).	√
10	COMP7404	Computational intelligence and machine learning	Nil, but knowledge of data structures and	√

			algorithms, probability, linear algebra, and programming would be an advantage.	
11	COMP7408	Distributed ledger and blockchain technology	COMP7906 Introduction to cyber security or ICOM6045 Fundamentals of e-commerce security and experience in programming is required.	√
12	ELEC6604	Neural networks, fuzzy systems and genetic algorithms	Nil	√
13	ELEC6098	Electronic and mobile commerce	Nil	
14	COMP7906	Introduction to cyber security	Mutually exclusive with: ICOM6045 Fundamentals of e-commerce security.	√
15	MEDD8860	Emerging technologies in STEM education	Nil	
16	CIVL7005	Sustainable construction technology: principles and practices (6 credits)	Nil	
17	CIVL7016	Land transport and the environment	Nil	
18	MITE6024	Teaching and learning with information technology	Nil	
19	MITE7352	Information technology and intellectual property law in education	Nil	
20	URBA6001	Foundations in spatial data analysis	Nil	
21	URBA6003	Programming and AI for future cities	URBA 6001 Foundations in spatial data analysis	
22	RECO7605	Information management	Nil	

- Remarks:

  For COMP7906, students with basic knowledge in Mathematics for CS, applied statistics and Python will be preferred.

  For MITE6024 and MITE7352, official approvals from the Faculty of Education are pending.

For URBA6001, URBA6003 and REC7605, official approvals from the Faculty of Architecture are pending.

List-C Disciplinary elective courses (Design in practice: Management)				
Count	**Course code**	**Course** (all 6 credits)	**Prerequisites**	**Study level (Advanced)**
1	MECH7012	Principles of engineering management	Nil	
2	COMP7802	Introduction to financial computing	This course does not require any prior knowledge in the area of finance. Basic calculus and numeric computational techniques are useful. Knowledge in Excel spreadsheet operations is required to complete the assignments and final project.	
3	COMP7901	Legal protection of digital property	Nil	
4	ELEC6603	Success in industrial entrepreneurship	Nil	
5	ELEC6092	Green project management	Nil	
6	ELEC6601	Industrial marketing	Nil	

Course code	Course
IDAT7001	Capstone project (12 credits)

Candidates shall select courses in accordance with the regulations of the degree. Candidates must complete a Project and 10 courses with the following requirements.

a) Candidates must complete at least 5 courses in List-A Disciplinary core courses with a total of ≥ 30 credits,
b) Candidates must complete at least 3 courses in List-B Disciplinary elective courses with a total of ≥ 18 credits.
c) Candidates can complete any number of course in List-C subject

COURSE DESCRIPTION

The following is a list of discipline courses. The list of courses below is not final and some courses may not be offered every year.

All courses are assessed through examination and/or coursework assessment, the weightings of which are subject to approval by the Faculty Board.

List-A Disciplinary core courses

IDAT70XX Innovative Design and R & D Principle (6 credits)

This course will focus on the innovative design principles and basic technology, including history of technology inventions and our living world, design fundaments, design process, creativity in design, solving design problem, design brief and specifications, understanding of design practices and technological principles in a variety of board inter-related design contexts, concept of IoT (Internet of Things). The specific course objectives are: (1) Encourage students to find connections between innovative design, technology, design and modern world; (2) To develop creative, analytical and critical thinking abilities in product design; to be able to apply the modelling tools in communication.

Assessment: 50 % coursework 50% examination

IDAT70XX Mechatronic systems design (6 credits)

This course will focus on the integration of mechanical, electrical and software engineering for the growing demand for efficient high-tech solutions in an increasing automated world It aims at training up the creative and elegant problem solving skills of the students who pursue new product launches, including fundamental methods for model-based design of mechatronic systems, multi-domain modelling, IoT (Internet of Things), simulation, robust control methods, performance analysis and evaluation of designs, diagnosis and maintenance of mechatronic systems. Students are required to develop creative behaviour with specific mechatronic products through the development of mini-projects.

Assessment: 50 % coursework 50% examination

IDAT70XX UAV design, navigation and control (6 credits)

This course aims to explore the key techniques of a small scale unmanned aerial vehicle (UAV), including sensor calibration, navigation systems, and advanced control techniques.

The specific course objectives are as follows:

- To have an overall understanding of UAVs: system configurations and applications.
- To study the modelling, motion planning and nonlinear control techniques for small-scale UAVs, such as nonlinear dynamic inversion and optimal control.
- To understand the common navigation techniques in modern small-scale UAVs, such as GPS / IMU navigation, visual-inertial navigation, and light detection and ranging (lidar) navigation.
- To conduct experiments on state-of-the-art navigation and control techniques for actual UAVs.

Prerequisites: MECH7010 Contemporary robotics, Good programming skills with MATLAB, C / C++, hands-on experiences

Assessment: 40% coursework 60% projects

IDAT70XX Advanced technologies and materials for product development (6 credits)

This course will focus on the advanced technologies and innovative materials which are popular in product development in modern design. It aims to equip students with knowledge and understanding of the advanced technology, e.g. VR, motion capture. It also covers the key properties of different innovative material in design and applications, including biomedical material, organic memory devices, flexible and stretchable energy harvesting devices, manufacturing and synthesis of materials.

Assessment: 50 % coursework 50% examination

IDAT70XX Computer programming for product development and applications (6 credits)

This course aims at equipping the students with practical skill in using computer programming to solve problems in product development. It focuses on the basic computer programming technique and how it can be applied in product development, e.g. software control, web applications and IoT (Internet of Things). It also covers the programming for Microsoft excel which is one of the most popular daily live software. Programming in Excel can release its power in different areas, e.g. data mining and database integration.

Assessment: 50 % coursework 50% examination

IDAT70XX Function Design, aesthetics design, manufacturing and intellectual property law (6 credits)

This course aims at the fundamental principles of function design and aesthetics design. It presents how to achieve a balance between practical factors and psychological factors in design concerns. It also focuses on the aesthetic design as well as the knowledge in different manufacturing method which are essential to realise a design to product in the market. In addition to design and manufacturing, this course will also introduce intellectual property law to protect the right of the product inventor.

Assessment: 50 % coursework 50% examination

MECH6034. Computer aided product development (6 credits)

This course will focus on main technologies related to computer-aided product development, including popular product development methodologies, computer-aided design, haptic shape modelling, reverse engineering, additive manufacturing and rapid tooling. The specific course objectives are: (1) To have a good understanding of popular product development methodologies, product development processes; (2) to understand major technologies that can be used to assist product development at different phases; (3) to be able to apply the computer-aided product development technologies to develop a simple product; and (4) to understand the constraints of manufacturing and cost in product development.

Topics include: product development methodologies; basic product manufacturing technologies; design for manufacturing; product costing and value engineering; solid modelling techniques; reverse engineering; additive manufacturing.

Assessment: 20% coursework 80% examination

COMP7503 Multimedia technologies (6 credits)

This course presents fundamental concepts and emerging technologies for multimedia computing. Students are expected to learn how to develop various kinds of media communication, presentation, and manipulation techniques. At the end of course, students should acquire proper skill set to utilise, integrate and synchronise different information and data from media sources for building specific multimedia applications. Topics include media data acquisition methods and techniques; nature of perceptually encoded information; processing and manipulation of media data; multimedia content organisation and analysis; trending technologies for future multimedia computing.

Assessment: 50% coursework and 50% examination

IELM6030. Ergonomics (6 credits)

Ergonomics and systems design. Physical ergonomics, anthropometry, biomechanics. Human information processing, person-machine interface design, displays and controls. The visual environment and visual performance. Thermal environment and effects on performance, indices of comfort. Noise; noise measurement, effects of noise, control of noise. Vibration and acceleration; human tolerance.

Assessment: 40% coursework and 60% examination

COMP7506 Smart phone apps development (6 credits)

Smart phones have become very popular in recent years. According to a study, by 2020, 70% of the world's population is projected to own a smart phone, an estimated total of almost 6.1 billion smartphone users in the world. Smart phones play an important role in mobile communication and applications.

Smart phones are powerful as they support a wide range of applications (called apps). Most of the time, smart phone users just purchase their favourite apps wirelessly from the vendors. There is a great potential for software developer to reach worldwide users.

This course aims at introducing the design issues of smart phone apps. For examples, the smart phone screen is usually much smaller than the computer monitor. We have to pay special attention to this aspect in order to develop attractive and successful apps. Various modern smart phone apps development environments and programming techniques (such as Java for Android phones and Swift for iPhones) will also be introduced to facilitate students to develop their own apps.

Students should have basic programming knowledge.

Assessment: 60% coursework and 40% examination

List-B Disciplinary elective courses (Technology)

MECH6010. Service behaviour of materials (6 credits)

The aims of this course are: (1) to study the relevant physical basis for the understanding and prediction of the service behaviour, such as creep, fracture, fatigue and corrosion, of materials in

industrial applications; and (2) to provide the knowledge to engineers the microstructure in such a way that the service behaviour of materials can be improved.

Topics include: creep regimes; creep mechanisms; creep resistant alloys; brittle fracture; ductile fracture; brittle-ductile transition; fracture mechanism maps; fatigue; Basquins and Coffin-Manson Laws; Goodman's relation; Palmgren-Miner rule; corrosion; electrochemical principles; forms of corrosion; corrosion control; case studies; service behaviour of engineering plastics; polymer-matrix composites.

Assessment: 30% coursework 70% examination

MECH6046. Microsystems for energy, biomedical and consumer electronics applications (6 credits)

Microelectromechanical systems (MEMS) and microfluidics have gradually found numerous applications in modern energy, mechanical engineering and biomedical engineering applications. This course aims to provide students with the necessary fundamental knowledge and experience in the working principles, design, materials, fabrication and packaging, and applications of MEMS and microfluidic systems. MEMS and microfluidic devices are emerging platforms for modern engineering applications in biomedicine, chemistry, material sciences and micro-machines. This is the course that will introduce graduate students and practicing engineers into the growing field of microsystem engineering. Practical examples will be given when delivering each major topic. Teaching of the course is also strengthened with case studies on carefully chosen topics. At the end of this course, students who fulfil the requirements of this course will be able to: (1) demonstrate ability to understand the fundamental principles behind MEMS and microfluidic; (2) differentiate different MEMS and microfluidic techniques and understand their importance in modern engineering; (3) apply concepts of micro-systems for industrial applications, particularly in energy, mechanical engineering and biomedical engineering.

Topics include: MEMS and microsystem products; microsensors; microactuators; microfluidic devices; multidisciplinary nature of microsystem design and manufacture; fluid mechanics in microscaled flows; materials for MEMS and microfluidic devices; fluid mechanics in microscaled flows; fabrication techniques of MEMS and microfluidic devices; flow characterisation techniques; flow control with microfluidics; microfluidics for life sciences and chemistry.

Students who have taken and passed MECH6032 will not be allowed to take MECH6046.

Assessment: 40% coursework 60% examination

MECH6047. Finite element analysis in mechanics (6 credits)

This course aims to: (1) introduce the basic concepts and procedures in finite element analysis; (2) introduce the methods of analysis using the finite element method for mechanics problems in engineering; and (3) provide hands-on experience on conducting various mechanics analyses by using a state-of-the-art finite element software.

Topics include: concepts and procedures in finite element analysis; elasticity analysis of truss, beam, plane and plate problems; thermo-mechanical analysis; modal analysis; direct integration methods for dynamic analysis; geometric and material nonlinear analyses; contact analysis; hands-on experience of finite element analysis.

Assessment: 50% coursework and 50% examination

MECH7010. Contemporary robotics (6 credits)

This course aims to explore the major technologies related to modern robotic systems, including the components and working principle of robots, automatic and computer-aided control, kinematics and control of mobile robots including drones and driverless cars, soft robots, etc.
The specific course objectives are: (1) to have a comprehensive understanding of robotic systems in terms of their system configurations, working principles, historical evolutions, and applications; (2) to understand the mathematical foundations, designs, data processing, and real-time control of various sensing and actuation units which comprise a robotic system; (3) to study the robot kinematics modelling, sensing, estimation, and control; (4) to explore the challenges and trends in contemporary robotic research, and the future directions for application of robotic components.

Assessment: 30% coursework 70% examination

IELM7021 Computational Optimisation and Intelligent Analytics (6 credits)

Overview of Intelligent optimisation and intelligent analytics; Genetic algorithms; Simulated annealing algorithm; Tabu search algorithm; Particle swarm optimisation; Ant colony optimisation; Predatory search strategy; Computational techniques and Intelligent optimisation strategies for dynamic systems; Data mining, decision analytics; Applications in multiple objective optimisation; Applications in constraint problems; Multiple level optimisation; Case studies in supply chain, logistics, manufacturing and service applications.

Assessment: 50% coursework and 50% examination

IELM7022 Advanced Cyber-Physical Systems (6 credits)

This course mainly consists of lectures and projects. The topics include introduction to cyber-physical systems (CPS), sensors and sensor networks, robotics and automation, communications for CPS, data analytics in CPS, digital twins, cloud computing for CPS, and system integrations. By completion of the projects, the topics will be discussed in the related lectures and hands-on experiments. The outcomes of each individual project will be integrated at the end to address CPS from system point of view as well in applications related settings.

Assessment: 100% coursework

IELM6034 Operational Research Techniques (6 credits)

The philosophy and methodology of Operational Research: problem analysis, model building, and implementation of solutions. Mathematical programming and its applications in logistics and supplies: vehicle scheduling, transportation and transhipments problems. Replacement models for capital equipment and preventive replacement for components of low capital value. Risk analysis for capital expenditure proposals. Queuing theory and event simulation with applications in serial and parallel supply chains.

Assessment: 20% coursework and 80% examination

COMP7103 Data mining (6 credits)

Data mining is the automatic discovery of statistically interesting and potentially useful patterns from large amounts of data. The goal of the course is to study the main methods used today for data mining and on-line analytical processing. Topics include data mining architecture; data preprocessing; mining association rules; classification; clustering; on-line analytical processing (OLAP); data mining systems and languages; advanced data mining (web, spatial, and temporal data).

Assessment: 50% coursework and 50% examination

COMP7606 Deep learning (6 credits)

Machine learning is a fast growing field in computer science and deep learning is the cutting edge technology that enables machines to learn from large-scale and complex datasets. Ethical implications of deep learning

and its applications will be covered first and the course will focus on how deep neural networks are applied to solve a wide range of problems in areas such as natural language processing, image processing, financial predictions, game playing and robotics. Topics covered include linear and logistic regression, artificial neural networks and how to train them, recurrent neural networks, convolutional neural networks, deep reinforcement learning, and unsupervised feature learning.

Popular deep learning software, such as TensorFlow, will also be introduced.

Prerequisite: COMP7404 Computational intelligence and machine learning (Knowledge of algorithms, calculus, linear algebra, and programming would be an advantage).

Assessment: 40% coursework and 60% examination

COMP7404 Computational intelligence and machine learning (6 credits)

This course will teach a broad set of principles and tools that will provide the mathematical, algorithmic and philosophical framework for tackling problems using artificial intelligence (AI) and machine learning (ML). AI and ML are highly interdisciplinary fields with impact in different applications, such as, biology, robotics, language, economics, and computer science. AI is the science and engineering of making intelligent machines, especially intelligent computer programmes, while ML refers to the changes in systems that perform tasks associated with AI. Ethical issues in advanced AI and how to prevent learning algorithms from acquiring morally undesirable biases will be covered.

Topics may include a subset of the following: problem solving by search, heuristic (informed) search, constraint satisfaction, games, knowledge-based agents, supervised learning, unsupervised learning; learning theory, reinforcement learning and adaptive control and ethical challenges of AI and ML.

Prerequisites: Nil, but knowledge of data structures and algorithms, probability, linear algebra, and programming would be an advantage.

Assessment: 50% coursework and 50% examination

COMP7408 Distributed ledger and blockchain technology (6 credits)

In this course, students will learn the key technical elements behind the blockchain (or in general, the distributed ledger) technology and some advanced features, such as smart contracts, of the technology.

Variations, such as permissioned versus permissionless and private blockchains, and the available blockchain platforms will be discussed.

Students will also learn the following issues: the security, efficiency, and the scalability of the technology. Cyber-currency (e.g. Bitcoin) and other typical application examples in areas such as finance will also be introduced.

Prerequisites: COMP7906 Introduction to cyber security or ICOM6045 Fundamentals of e-commerce security and experience in programming is required.

Assessment: 50% coursework and 50% examination

COMP7906 Introduction to cyber security (6 credits)

The aim of the course is to introduce different methods of protecting information and data in the cyber world, including the privacy issue. Topics include introduction to security; cyber attacks and threats; cryptographic algorithms and applications; network security and infrastructure.

Mutually exclusive with: ICOM6045 Fundamentals of e-commerce security

Remarks: students with basic knowledge in Mathematics for CS, applied statistics and Python will be preferred.

Assessment: 50% coursework and 50% examination

ELEC6604 Neural networks, fuzzy systems and genetic algorithms (6 credits)

This course provides a general introduction to neural networks, fuzzy systems and genetic algorithms. The fundamental concepts and techniques of these three areas will be given. The course will also provide examples on the application of neural networks, fuzzy systems and genetic algorithms to a variety of engineering problems. This course will cover three important topics in the field of Applied Artificial Intelligence. By the end of this course, student should possess a firm grounding in the concepts and techniques of neural network, fuzzy system and genetic algorithm. The student should be able to apply the acquired knowledge to the development of intelligent systems or to the exploration of research problems.

Assessment: 30% coursework and 70% examination

ELEC6098 Electronic and mobile commerce (6 credits)

This course aims at introducing both technical, commercial and managerial knowledge on electronic commerce and mobile. The course will start with an introduction to the Business-to-Consumer (B2C) Model; Business-to- Business (B2B) model, followed by an overviews of different enabling technologies for electronic commerce and mobile commerce such as the location base technology, RFID, GPS, mobile network, electronic payment, server-side and channel security, Near Field Communication, QR Code, augmented reality and other latest technologies deploying in the industry. By the end of the course, the research trend and the way forward of the industry will be discussed.

Mutually exclusive with: ELEC6078, ELEC6086

Assessment: 30% coursework and 70% examination

MEDD8860 Emerging technologies in STEM education (6 credits)

This course explores a broad range of current and emerging tools, practices and themes in STEM education. Also, the course will review current and future research trends in emerging tools, practices and themes in STEM Education. The course begins by exploring the historical development of crossdisciplinary integration in STEM education, in order to equip students with an overall picture on the types and trends of digital technology used for delivering STEM education in the past, present and future classrooms. Furthermore, the course explores uses of robotics as a mean of integration (e.g. Micro:bit, MakeBlock, Arduino, Lego Mindstorms, etc.). Also, attention will be given to product design and 3D printing as a special form of engineering design in integrated STEM. Finally, emerging tools such as mobile, wearable, VR, Augmented VR technology, etc., will be explored in context of STEM integration.

Assessment: 100% coursework.

CIVL7005 Sustainable construction technology: principles and practices (6 credits)

This course provides in-depth knowledge of technology in the context of sustainable construction, with the syllabus covering concepts of sustainable construction; systems theories; technological innovation theories; types of technology and their applications; technology selection and management strategy.

Assessment: 40% coursework and 60% examination

CIVL7016 Land transport and the environment (6 credits)

Land transport systems; Rail and road construction; Rail noise emissions and abatement; Air, noise and water pollution of roads; Road related air and noise emission measurements, estimation and abatement approaches.

Assessment: 30% coursework, 10% Quizzes and 60% examination

MITE6024. Teaching and learning with information technology (6 credits)

This course provides a comprehensive introduction to the use of information technology for teaching and learning. Topics range from traditional applications e.g. computer-based tutorials to more contemporary applications such as the use of learning objects, cognitive tools and collaborative technologies. The course highlights theories of learning underpinning technology integration and the educational contexts within which these are intended to be used.

Assessment: 100% coursework

MITE7352. Information technology and intellectual property law in education (6 credits)

This course explores the legal issues and ethical challenges related to information technology (IT) and intellectual property (IP) law which is often involved in education. It investigates the introductory legal and ethical knowledge in relation to the design and implementation of educational technology and digital learning environment in both schools and organisational learning contexts. This course offers opportunities to students with non-legal background to consider IT policies and strategies from legal perspectives, and equips them with a sound understanding of legal principles in using IT to support the innovation in IP through leadership roles at institutional level. Legal and ethical issues in IT and IP such as digital ownership, cyber-speech, cyberbullying in social networks, cybercrimes, copyright infringement and software, copyright in the digital environment, fair use of copyrighted work, the database right, privacy and data protection, and law enforcement in the information society as well as other emerging issues will be examined.

Assessment: 100% coursework

URBA6001 Foundations in Spatial Data Analysis (6 credits)

Spatial data has become indispensable for building a smart city, particularly in city planning, design and management. This involves new means of capturing spatial data by different types of sensors, advanced application of Artificial Intelligence (AI) and rapid development of spatial analytics in the area of Geographic Information System (GIS) and Building Information Modelling (BIM). The main objective of this course is to equip students from relevant disciplines (e.g. land use planning, surveying, architecture, landscape architecture, engineering, environmental science and social sciences) with foundational knowledge and techniques on spatial data analysis.

Assessment: 50 % continuous coursework assessment ; 50% examination

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URBA6003 Programing and AI for Future Cities (6 credits)

This course provides an introduction to programming, computational thin king, and artificial intelligence (AI), which have become essential skills in the fields of smart cities and urban science. Students are expected to reflect how software, data, smart technologies, and AI are becoming integral to future smart cities; learn key concepts, algorithms, and data structures; acquire skills and experiences in computer programming; and understand how programming can be applied to solve urban problems.

Prerequisite: URBA 6001 Foundations in Spatial Data Analysis.

Assessment: 100% continuous coursework assessment

RECO7605 Information management (6 credits)

This course focuses on the tasks associated with informative and supply chain management and their associated fundamental knowledge and information management theories. Information, human, monetary and resource flows; manufacturing and construction supply chain management; efficiency and responsiveness; integration through IT or common information management tools and techniques; interorganisational, cultural and contractual issues; supply chain integrity.

Assessment: 60% coursework 40% Examination

List-C Disciplinary elective courses (Design Practice: Management)

MECH7012. Principles of engineering management (6 credits)

The focus of this course is on the basic principles, methods, and functions of engineering management. An overview of systems engineering is provided, with coverage on the design and management of an enterprise as an integrated system. The course objectives are: (1) acquire the essential principles of engineering management and understand how to apply these principles in daily practice in industry; and (2) understand and apply methods for managing the operations of engineering companies in the global business environment.

Topics include: systems engineering; core concepts and tools for the management of operations: operations planning and control functions, ERP systems; contemporary topics and approaches in engineering management: supply chain, green management, ethics, corporate social responsibility and compliance, risk and crisis management.

Assessment: 30% coursework 70% examination

COMP7802 Introduction to financial computing (6 credits)

This course introduces the students to different aspects of financial computing in the investment banking area. The topics include yield curve construction in practice, financial modelling and modern risk management practice, etc. Financial engineering is an area of growing demand. The course is a combination of financial product knowledge, financial mathematics and computational techniques. This course will be suitable for students who want to pursue a career in this fast growing area.

Prerequisites: This course does not require any prior knowledge in the area of finance. Basic calculus and numeric computational techniques are useful. Knowledge in Excel spreadsheet operations is required to complete the assignments and final project.

Assessment: 50% coursework and 50% examination

COMP7901 Legal protection of digital property (6 credits)

This course introduces computer professionals to the various legal means of protecting digital property including computer software, algorithms, and any work or innovation in digital form. Focus is on the main issues in protecting digital property arising from developments in information technology, and their legal solutions. Topics covered include, but are not limited to, the following: 1) Copyright protection of software

and websites, 2) Patent protection of software and algorithms, 3) Criminal sanctions against offences involving the digital technology.

Mutually exclusive with: ECOM6004 Legal aspects of IT and e-commerce

Assessment: 30% coursework and 70% examination

ELEC6092 Green project management (6 credits)

This course aims at introducing Green Project Management. By giving a brief account on the environmental issues, the course will begin by explaining the scope and value of green projects. It will illustrate the importance of clarity of mission and goals of green projects; and how these could be done by means of audit and feasibility study. It will also describe how green project planning and control can be implemented with proper system tools. The basic theory regarding contract management: project strategy, contract documents, tendering procedure and contingency shall be introduced. It will also give examples of site implementation: partnership collaboration; project quality assurance; safety management; environmental issues and risk management. The course shall be concluded by detailing project quality assurance; safety management.

Assessment: 30% coursework and 70% examination

ELEC6601 Industrial marketing (6 credits)

This course covers the following topics: Business to business marketing; value chain; character of industrial marketing; marketing opportunities; marketing strategies; channel relationships; sales and sales management; marketing communications; customer programmes; business ethics; and crisis management.

By means of problem-based learning, case studies, guest induction, team interaction and lectures, a student shall improve feeling of industrial marketing models; along with understanding of underlying practices and business concepts. The student shall acquire skill and proficiency through the projects and presentations. He shall be able to apply concepts, and where possible, be able to develop innovative models for potential applications.

Assessment: 50% coursework and 50% examination

ELEC6603 Success in industrial entrepreneurship (6 credits)

This course covers the following topics: Framework for entrepreneurship; identifying resources, capabilities, environments, opportunities and strategies; business plan; financing the new venture; risk balancing and staged financing; creating an organisation.

By means of problem-based learning, case studies, guest induction, team interaction and lectures, a student shall improve feeling of entrepreneurship and new opportunities; along with understanding of successful models and business concepts. The student shall acquire skill and proficiency through the projects and presentations. He shall be able to apply concepts and to elaborate successful opportunities and extend them to potential applications.

Assessment: 50% coursework and 50% examination

Capstone Requirement

IDAT7001 Capstone Project (12 credits)

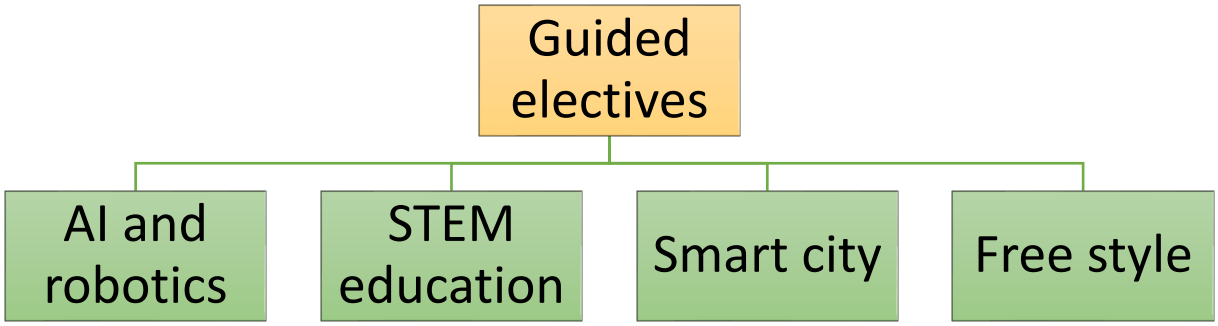
For the Capstone Project, it is a project-based work aims to provide students with capstone experience to work on a real-world problem and carry out a substantial project which requires integration of the knowledge they have learnt in the curriculum. Students will work in solo or small groups under the guidance of their supervisor(s) from any department of the Engineering Faculty or other relevant faculties. Students are required to attend workshops, seminars and submit a substantial written report as well.

Assessment: 100% coursework

Guided Electives and Capstone Project Arrangement

Guided Electives

The field of this MSc program is broad and involves studies at the fundamental scientific level as well as frontier of technology. To assist students in planning their career, 'guided electives' – recommended combinations of courses appropriate for widely chosen areas within the program are listed here. With reference to the feedback from students in the program, the guided electives will be subjected to review biyearly.



1) Guided electives on AI and robotics

Disciplinary core courses (Innovative Design)	Disciplinary elective courses
IDAT70XX Innovative design and R & D principle	**MECH7010** Contemporary robotic
IDAT70XX Mechatronic systems design	**ELEC6604** Neural networks, fuzzy systems and genetic algorithms
IDAT70XX Advanced technologies and materials for product development.	**COMP7606** Deep learning
IDAT70XX Functional design, aesthetics design, manufacturing and intellectual property law.	**COMP7404** Computational intelligence and machine learning
IELM6030 Ergonomics	**IELM7022** Advanced cyber-physical systems

2) Guided electives on STEM education

Disciplinary core courses (Innovative Design)	Disciplinary elective courses
IDAT70XX Innovative design and R & D principle	**MEDD8860** Emerging technologies in STEM education

IDAT70XX Mechatronic systems design	**MITE6024** Teaching and learning with information technology
IDAT70XX Advanced technologies and materials for product development.	**MITE7352** Information technology and intellectual property law in education
IDAT70XX Functional design, aesthetics design, manufacturing and intellectual property law.	
IELM6030 Ergonomics	

3) Guided electives on Smart City

Disciplinary core courses (Innovative Design)	Disciplinary elective courses
IDAT70XX UAV design, navigation and control	**RECO7605** Information management
	URBA6001 Foundations in spatial data analysis
	URBA6003 Programming and AI for future cities
	COMP7606 Deep learning
	IELM7022 Advanced cyber-physical systems
	CIVL7005 Sustainable construction technology: principles and practices
	CIVL7016 Land transport and the environment