

[Subject to change](#)

REGULATIONS FOR THE DEGREE OF MASTER OF SCIENCE IN ENGINEERING (MSc[Eng])

(Applicable to students admitted in the academic year 2025-26 and thereafter)

(See also General Regulations and Regulations for Taught Postgraduate Curricula)

The degree of MSc(Eng) is a postgraduate degree awarded for the satisfactory completion of a prescribed curriculum in the Faculty of Engineering.

The major part of the curriculum must include courses offered in one of the following fields: building services engineering, civil engineering, electrical and electronic engineering, energy engineering, industrial engineering and logistics management, infrastructure engineering and management, innovative design and technology, low-altitude technology, mechanical engineering, microelectronics science and technology, and robotics and intelligent systems.

The MSc(Eng) curriculum is offered in part-time and full-time modes, with the exception of Master of Science in Engineering in Low-Altitude Technology (MSc(Eng)(LAT)), which is exclusively offered in full-time mode.

MSc 1 Admission requirements

To be eligible for admission to the curriculum leading to the degree of MSc(Eng), a candidate shall:

- (a) comply with the General Regulations;
- (b) comply with the Regulations for Taught Postgraduate Curricula;
- (c) hold
 - (i) a Bachelor's degree of this University in a related field; or
 - (ii) a relevant qualification of equivalent standard from this University or from another university or comparable institution accepted for this purpose; and
 - (iii) in respect of the courses of study leading to the degree of Master of Science in Engineering in the fields of Innovative Design and Technology, Low-Altitude Technology, and Microelectronics Science and Technology, a Bachelor's degree in Engineering or related Science discipline;
 - (iv) in respect of the courses of study leading to the degree of Master of Science in Engineering in Civil Engineering, a Bachelor's degree in related disciplines, such as Environmental Engineering, Chemical Engineering, Mechanical Engineering, Environment-related Sciences, Computer Science, Mathematics or Statistics;
 - (v) in respect of the courses of study leading to the degree of Master of Science in Engineering in Infrastructure Engineering and Management, a Bachelor's degree in related disciplines, such as Architecture, Civil Engineering, Computer Science, Construction Management, Electrical and Electronic Engineering, Industrial and System Engineering, Mechanical Engineering, Smart Construction,

Structural Engineering, Surveying, Transportation Engineering or Urban Planning; and

- (d) satisfy the examiners in a qualifying examination if required.
-

MSc 2 Qualifying Examination

- (a) A qualifying examination may be set to test the candidate's academic ability or his/her ability to follow the curriculum prescribed. It shall consist of one or more written papers or their equivalent and may include a dissertation.
- (b) A candidate who is required to satisfy the examiners in a qualifying examination shall not be permitted to register until he/she has satisfied the examiners in the examination.
-

MSc 3 Period of Study

- (a) The curriculum of the degree of MSc(Eng) (except for MSc(Eng)(LAT)) shall normally extend over one academic year of full-time study or two academic years of part-time study. Candidates shall not be permitted to extend their studies beyond the maximum period of registration of two academic years of full-time study or three academic years of part-time study, unless otherwise permitted or required by the Board of Faculty. For both full-time and part-time modes, the period of study shall include any assessment to be held during and/or at the end of each semester.
- (b) The curriculum of the degree of MSc(Eng)(LAT) shall normally extend over one and a half academic years of full-time study. Candidates shall not be permitted to extend their studies beyond the maximum period of registration of three academic years of full-time study, unless otherwise permitted or required by the Board of Faculty. The period of study shall include any assessment to be held during and/or at the end of each semester.
-

MSc 4 Curriculum Requirements

To complete the curriculum, a candidate shall, within the prescribed maximum period of registration stipulated in Regulation MSc3 above:

- (a) satisfy the requirements prescribed in TPG6 of the Regulations for Taught Postgraduate Curricula;
- (b) take courses and satisfy the credit requirements as follows:
- (i) for the degree of MSc(Eng) (except for MSc(Eng)(LAT)), take not fewer than 72 credits of courses, in the manner specified in these regulations and syllabuses and pass all courses as specified in the syllabuses;
 - (ii) for the degree of MSc(Eng)(LAT), take not fewer than 84 credits of courses, in the manner specified in these regulations and syllabuses and pass all courses as specified in the syllabuses;
- (c) follow courses of instruction and complete satisfactorily all prescribed practical / laboratory work; and
- (d) satisfy the examiners in all forms of assessment as may be required in either:
- (i) for the degree of MSc(Eng) (except for MSc(Eng)(LAT)):

- (1) 72 credits of courses which must include a dissertation of 24 credits or a project of 12 credits as capstone experience; or
 - (2) at least 60 credits of courses successfully completed at this University (which must include a dissertation of 24 credits or a project of 12 credits) and not more than 12 credits of courses successfully completed at this or another university before admission to the MSc(Eng) and approved by the Board of the Faculty.
- (ii) for the degree of MSc(Eng)(LAT):
- (1) 84 credits of courses which must include a dissertation of 30 credits as capstone experience; or
 - (2) at least 72 credits of courses successfully completed at this University (which must include a dissertation of 30 credits) and not more than 12 credits of courses successfully completed at this or another university before admission to the MSc(Eng)(LAT) and approved by the Board of the Faculty.
-

MSc 5 Dissertation or project report

- (a) A candidate who is permitted to select a dissertation or a project is required to submit the dissertation or the project report by a date specified by the Board of Examiners.
 - (b) All candidates shall submit a statement that the dissertation or the project report represents his/her own work undertaken after the registration as a candidate for the degree.
-

MSc 6 Selection of Courses

- (a) A candidate shall select courses according to the guidelines stipulated in the syllabuses for the degree of MSc(Eng).
 - (b) Selection of study patterns, as stipulated in the respective syllabus, shall be subject to the approval of the Head of the Department concerned.
 - (c) Candidates shall select their courses in accordance with these regulations and the guidelines specified in the syllabuses before the beginning of each academic year.
 - (d) Changes to the selection of courses may be made only during the add/drop period of the semester in which the course begins, and such changes shall not be reflected in the transcript of the candidate.
 - (e) Subject to the approval of the Committee on Taught Postgraduate Curricula on the recommendation of the Head of the Department concerned, a candidate may in exceptional circumstances be permitted to select additional course(s).
 - (f) Requests for changes after the designated add/drop period of the semester shall be subject to the approval of the Committee on Taught Postgraduate Curricula. Withdrawal from courses beyond the designated add/drop period will be subject to the approval of the Committee on Taught Postgraduate Curricula.
-

MSc 7 Assessment

- (a) The written examination for each course shall be held after the completion of the prescribed course of study for that course, and not later than January, May or August immediately following the completion of the course of study for that course unless otherwise specified in the syllabuses.
- (b) A candidate, who is unable to complete the requirements within the prescribed maximum period of registration specified in Regulation MSc 3 because of illness or circumstances beyond his/her control, may apply for permission to extend his/her period of studies.
- (c) A candidate who has failed to satisfy the examiners in any course(s) is required to make up for failed course(s) in the following manners:
- (i) undergoing re-assessment/re-examination in the failed course(s); or
 - (ii) repeating the failed course(s) by undergoing instruction and satisfying the assessments; or
 - (iii) taking another course in lieu and satisfying the assessment requirements.
- (d) A candidate who has failed to satisfy the examiners in his/her dissertation or project report may be required to submit or resubmit a dissertation or a project report on the same subject within a period specified by the Board of Examiners.
- (e) In accordance with G9(h) of the General Regulation and TPG8(d) of the Regulations for Taught Postgraduate Curricula, there shall be no appeal against the results of examinations and all other forms of assessment.

MSc 8 Grading system

Individual courses shall be graded according to the following grading system as determined by the Board of Examiners:

Standard	Grade	Grade Point
Excellent	A+	4.3
	A	4.0
	A-	3.7
Good	B+	3.3
	B	3.0
	B-	2.7
Satisfactory	C+	2.3
	C	2.0
	C-	1.7
Pass	D+	1.3
	D	1.0
Fail	F	0

MSc 9 Discontinuation of Studies

Unless otherwise permitted by the Board of the Faculty, a candidate will be recommended for discontinuation of their studies in accordance with General Regulation G12 if he/she has:

- (a) failed to pass 12 credits in an academic year; or

- (b) failed to satisfy the examiners at a second attempt in his/her dissertation or project report within the specified period; or
- (c) failed to achieve a cumulative grade point average* (CGPA) of 1.0 or higher for two consecutive semesters with course enrolment; or
- (d) exceeded the maximum period of registration specified in Regulation MSc3.

* *At the end of each semester, a cumulative grade point average (CGPA) for all courses, except cross-listed undergraduate courses and outside curriculum requirement optional courses as specified in the syllabuses, taken by a student (including failed courses) at the time of calculation is computed.*

MSc 10 Advanced Standing

Advanced standing may be granted to candidates in recognition of studies completed successfully before admission to the curriculum in accordance with TPG3 of the Regulations for Taught Postgraduate Curricula. Candidates who are awarded Advanced Standing will not be granted any further credit transfer for those studies for which Advanced Standing has been granted. The amount of credits to be granted for Advanced Standing shall be determined by the Board of the Faculty, in accordance with the following principles:

- (a) a candidate may be granted a total of not more than 20% of the total credits normally required under a curriculum for Advanced Standing unless otherwise approved by the Senate; and
- (b) credits granted for advanced standing shall not be included in the calculation of the GPA but will be recorded on the transcript of the candidate.

MSc 11 Award of Degree

To be eligible for the award of the degree of MSc(Eng), a candidate shall:

- (a) comply with the General Regulations and the Regulations for Taught Postgraduate Curricula;
- (b) complete the curriculum and satisfy the examiners in accordance with the regulations set out; and
- (c) achieve a cumulative grade point average (CGPA) of 1.0 or higher.

MSc 12 Assessment results

On successful completion of the curriculum, candidates who have shown exceptional merit of achieving a cumulative grade point average (CGPA) of 3.6 or higher may be awarded a mark of distinction, and this mark shall be recorded on the candidates' degree diploma.

Subject to change

MASTER OF SCIENCE IN ENGINEERING IN ROBOTICS AND INTELLIGENT SYSTEMS (Applicable to students admitted to the curriculum in the academic year 2025-26 and thereafter)

Definition and Terminology

Discipline course – any course offered by the curriculum of the Master of Science in Engineering in Robotics and Intelligent Systems (MSc(Eng)(RIS)).

Fundamental course – a specific number of discipline courses in the curriculum that a student must pass.

Elective course – any course offered at taught postgraduate level by the Departments of the Faculty of Engineering, and selected courses in the subject areas of COMP, ECOM, FITE, ICOM offered by the School of Computing and Data Science, for the fulfilment of the curriculum requirements of the degree of MSc(Eng)(RIS) that are not classified as discipline courses.

Capstone Experience – a dissertation or a project which is a compulsory and integral part of the curriculum.

Curriculum Structure

Candidates are required to complete 72 credits of courses, as set out below.

Course Category	Enrolment Mode	
	8 Courses + Dissertation	10 Courses + Project
Discipline Courses (including 3 Fundamental Courses)	Not less than 36 credits	Not less than 48 credits
Elective Courses	Not more than 12 credits	
Capstone	Dissertation (24 credits)	Project (12 credits)
Total	72 credits	

Candidates are permitted to select courses in accordance with Regulations MSc4, MSc5 and MSc6. The curriculum provides two enrolment modes for candidates to choose from either (i) 8 courses plus a dissertation, or (ii) 10 courses plus a project. In choosing the enrolment mode (i), candidates must complete a 24-credit dissertation and at least 6 discipline courses (including 3 fundamental courses); for enrolment mode (ii), candidates must complete a 12-credit project and at least 8 discipline courses (including 3 fundamental courses).

Candidates choosing any enrolment mode can take no more than 2 elective courses out of Taught Postgraduate level courses offered by other curricula in the Faculty of Engineering, and selected courses in the subject areas of COMP, ECOM, FITE, ICOM offered by the School of Computing and Data Science. All selection will be subjected to approval by the Course Coordinator.

The curriculum is offered in both part-time and full-time modes. For the part-time mode of study, the curriculum shall extend over not less than two and not more than three academic years of study. For the full-time mode of study, the curriculum shall extend over not less than one and not more than two academic years of study.

The curriculum provides advanced education and training in the philosophy, methods and techniques of robotics and artificial intelligence, which are essential for developing and deploying advanced robots and intelligent systems in many fields from manufacturing and logistics to healthcare and education.

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

The following is a list of discipline courses offered by the Department of Data and Systems Engineering. It should be noted that not all of the courses listed below are offered every year:

List of Discipline Courses (All courses are 6 credits, unless otherwise specified.)

Fundamental Courses (compulsory):

DASE7501 Robot modelling, planning and control
DASE7502 Advanced robot sensing and intelligence
DASE7503 Robotic systems integration

Capstone Course (compulsory):

DASE7098 Project (12 credits) or
DASE7099 Dissertation (24 credits)

Other Discipline Courses:

ELEC6008 Pattern recognition and machine learning
ELEC6026 Digital signal processing
ELEC6099 Wireless communications and networking
ELEC6100 Digital communications

DASE7113 Optimization methods for intelligent systems
DASE7128 Human factors engineering
DASE7137 Virtual reality and applications
DASE7138 Healthcare systems engineering
DASE7139 Cyber-physical systems
DASE7140 Machine learning and applications
DASE7141 Advanced digital twin and applications
DASE7142 Advanced computational methods
DASE7143 The internet of things
DASE7154 Intelligent technologies for systems engineering A
DASE7155 Intelligent technologies for systems engineering B
DASE7504 Human-robot collaboration
DASE7505 Intelligent unmanned systems
DASE7507 Frontiers in robotics and intelligent systems
MECH7010 Contemporary robotics
MECH7017 Robotic control
MECH7020 Autonomous drones
MECH7021 Field and services robotics

Elective Courses

Please consult courses offered for other taught postgraduate curricula in the Faculty of Engineering.

Calendar entries for discipline courses included in the MSc(Eng)(RIS) curriculum

ELEC6008. Pattern recognition and machine learning (6 credits)

This course aims at providing fundamental knowledge on the principles and techniques of pattern recognition and machine learning.

Specifically, the course covers the following topics: Bayes decision theory; parametric and non-parametric methods; linear discriminant functions; unsupervised learning and clustering; feature extraction; neural networks; context-dependent classification; case studies.

Pre-requisite: A good background in linear algebra, programming experience.

Mutually exclusive with: COMP7504 Pattern recognition and applications

ELEC6026. Digital signal processing (6 credits)

This course provides an introduction to the fundamental concepts of digital signal processing (DSP) including a wide variety of topics such as discrete-time linear-time invariant systems, sampling theorem, z-transform, discrete-time/discrete Fourier transform, and digital filter design. Furthermore, the course will also discuss in detail about other advanced topics in digital signal processing such as multidimensional signals and systems, random processes and applications, and adaptive signal processing.

ELEC6099. Wireless communications and networking (6 credits)

5G refers to the fifth generation wireless technologies for digital cellular networks that began wide deployment in 2019. This course aims at introducing the core principles and technologies for 5G communications and networking. The first half focuses on basic concepts and techniques including radio propagation, digital modulation, Orthogonal Frequency Division Multiplexing (OFDM), Multiple-Input-Multiple-Output (MIMO) Communication. The second half provides a comprehensive introduction to 5G covering physical layer (PHY) technologies, millimetre wave (mmWave) communications, network virtualization and slicing, provides an introduction to different types of networks including cellular networks, satellite communication networks, narrow-band Internet-of-Things (NB-IoT).

Mutually exclusive with: ELEC6040, ELEC6071 and ELEC6087

ELEC6100. Digital communications (6 credits)

This course aims at enabling the fundamental understanding of the digital communication systems. After an overview on basic probability and random processes, the course will cover the modulation and demodulation. Then, performance analyses under additive white Gaussian noise channel and fading channel are examined. This is followed by topics on spatial diversity and channel equalization.

Mutually exclusive with: ELEC6014 and ELEC6045

DASE7098. Project (12 credits)

A group of students will work on a supervised project that relates to major research and/or industrial projects and initiatives that supervisors have recently carried out. Groups are expected to generate project deliverables of a variety of forms including patents, software copyrights, research papers, proof-of-the-concept solutions and products, consultancy reports / whitepapers, etc. This course will provide students

with a range of opportunities to engage in academic research, industrial innovation and entrepreneurship development.

DASE7099. Dissertation (24 credits)

Student individuals will undertake a supervised project which will be assessed. The dissertation module must relate to the subject matter and be agreed by the Department of Industrial and Manufacturing Systems Engineering. The Dissertation can be related to research projects within the department or industry-related projects.

DASE7113. Optimization methods for intelligent systems (6 credits)

Overview of optimization theory; linear and nonlinear programming; integer programming; simplex method; steepest descent method; Newton's method; Frank-Wolfe algorithm; branch-and-bound algorithm; emerging topics in optimization; applications in data science; applications in real-world engineering systems (e.g., energy, transportation, logistics, service)

DASE7128. Human factors engineering (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.

DASE7137. Virtual reality and applications (6 credits)

Fundamental concept of virtual reality, augmented and mixed reality; human perception and virtual reality; system components of modern virtual reality systems; applications of virtual reality technology in engineering systems design and analysis, immersive and interactive virtual environments; innovation and consciousness with virtual reality system development and deployment, ethical issues and social impacts of adopting virtual reality in system development. Designing and building virtual systems with immersive virtual reality systems including CAVE-like environment and VR headsets.

DASE7138. Healthcare systems engineering (6 credits)

Introduction to healthcare delivery systems; healthcare technology-human integration; human factors in healthcare; crew resource management; quality of care; economic analysis in healthcare; healthcare logistics; healthcare system test and evaluation; analysis and design for patient safety.

DASE7139. 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 the individual projects will be integrated at the end to address CPS from system point of view as well in applications related settings.

DASE7140. Machine learning and applications (6 credits)

Overall view of machine learning methods. Supervised learning, unsupervised learning, reinforcement learning. Support-vector machines, linear regression, decision trees, k-nearest neighbor algorithm, neural networks. Active learning, classification and regression. Model training, testing, selection, and validation. Performance evaluation. Industrial applications in forecasting, ranking, recommendation systems, information extraction, object recognition in computer vision, and pattern recognition.

DASE7141. Advanced digital twin and applications (6 credits)

This course teaches fundamental technologies of digital twin. Overall view of basic concepts related to digital twin. How to build blocks of digital twin. The setup of sensor systems and digital twin infrastructures. The integration, testing, monitoring and maintenance of digital twin. Data collection, processing, storage, transmission, and synchronization. Simulation and decision-making support in industrial engineering and logistics management.

DASE7142. Advanced computational methods (6 credits)

This course teaches fundamental computational methods and the applications to engineering problems in the context of industrial engineering. Analytical models, algorithms, and simulation methods will be discussed. Variability and uncertainty in engineering problems. Foundations of probability, sampling distributions, confidence intervals. Interpolation and regression. Numerical solution of linear and non-linear equations, numerical differentiation and integration, boundary value problems, initial value problems and partial differential equations. Monte Carlo method.

DASE7143. The internet of things (6 credits)

Theory and fundamentals of internet of things (IoT). Methods to create abstractions, formalisms and semantics at IoT layer. Artificial intelligence of things, machine learning for IoT, edge computing. IoT challenges in security, reliability and privacy. Device software development, IoT in cloud-to-thing-continuum. IoT software development, test beds and quality assurance. Sensors and actuators, remote operations and control. IoT applications in manufacturing, construction, healthcare, logistics and supply chain management.

DASE7154. Intelligent technologies for systems engineering A (6 credits)

This course is part of the series “Intelligent technologies for systems engineering”. This series of courses are designed to introduce students to critical technologies with applications in intelligent engineering systems. The course will cover essential topics about the intelligent technologies with an emphasis on their augmentation in data engineering and analytics. Students will learn the fundamental theories and knowledge related to the technologies, and how to leverage such technologies to enhance various aspects of industrial engineering. This course mainly consists of lectures and projects.

DASE7155. Intelligent technologies for systems engineering B (6 credits)

This course is part of the series “Intelligent technologies for systems engineering”. This series of courses are designed to introduce students to critical technologies with applications in intelligent engineering systems. The course will cover essential topics about the intelligent technologies with an emphasis on their

integration into complex industrial systems. Students will learn the fundamental theories and knowledge related to the technologies; and gain hands-on experience in implementing these technologies to improve efficiency, productivity and performance of the industrial systems. This course mainly consists of lectures and projects.

DASE7501. Robot modelling, planning and control (6 credits)

This course focuses on the fundamental concepts and techniques in robotics modelling, planning, and control. Topics covered will include forward and inverse kinematics, Jacobian matrix; Lagrangian mechanics, Euler-Lagrange equations; Linear and nonlinear interpolation, path planning and trajectory planning; motion and force control; intelligent robot control; Robot operating system (ROS); programming.

DASE7502. Advanced robot sensing and intelligence (6 credits)

This course focuses on the theories and algorithms in image processing and computer vision. Topics include image acquisition; image representation; image enhancement; image segmentation; image feature extraction; image restoration; mathematical morphology; image compression; scene understanding and motion analysis. Students will gain practical experience in implementing algorithms for image processing using Python or MATLAB.

DASE7503. Robotic systems integration (6 credits)

This course provides students with hands-on experience in designing, building, and programming robotic systems. It will enable the student to understand and work with robot hardware and software. Topics include electronic circuit design and implementation, embedded system development and programming, computer-aided-design, 3D printing, Robot Operating System (ROS), program advanced robotic systems (both industrial and mobile). Throughout the course, students will work in teams.

DASE7504. Human-robot collaboration (6 credits)

Human-robot interaction is a multidisciplinary field with contributions from artificial intelligence, robotics, natural language processing, design, and psychology. This course will focus on the emerging field of human-robot interaction technologies and systems. Topics include wearable sensors; brain computer interface; human-robot physical interaction; human-robot collaboration; wearable robots; tele-robotics.

DASE7505. Intelligent unmanned systems (6 credits)

This course will introduce students to the field of autonomous mobile robotics. Topics will focus on definition and applications of mobile robots; mobile robot components and architecture; kinematics and dynamics of mobile robots; sensors for mobile robots; planning and navigation for mobile robot; simultaneous localization and mapping; mobile manipulators; applications. The assignments of this course will involve building and testing autonomous mobile robots using simulation software and physical robots.

DASE7507. Frontiers in robotics and intelligent systems (6 credits)

The aim of this series is to provide students with a deeper understanding of the advance topics under the five areas of focus of this programme. This course focuses on the fundamental theories and advanced engineering technologies related to robotics and intelligent systems. Through this course, students are

expected to have a holistic view of the fundamental theories and technologies for robotics and intelligent systems. This course mainly consists of lectures and projects.

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.

MECH7017. Robotic control (6 credits)

This course focuses on the fundamental principles of modeling, analysis, and control applied to robotics, utilizing both conventional and modern approaches. The course objectives are: (1) to equip students with the skills to employ various modeling methods for characterizing different types of robots; and (2) to foster a comprehensive understanding of control schemes for robotic systems. Topics include: Frequency domain analysis; Nyquist stability criterion; linear control system design; state-space analysis of multivariable linear system; controllability and observability; stability analysis; control of robotic systems.

MECH7020. Autonomous drones (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: 1) To have an overall understanding of UAVs: system configurations and applications. 2) To study the modelling, motion planning and nonlinear control techniques for small-scale UAVs, such as nonlinear dynamic inversion and optimal control. 3) 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. 4) To conduct experiments on state-of-the-art navigation and control techniques for actual UAVs.

This course covers the following topics: UAV configuration; UAV materials; innovative design methodology; dynamics and modeling; motion planning; path planning and obstacle avoidance; classic UAV control; modern UAV control; optimal and nonlinear control; navigation; state estimation; sensor fusion; visual odometry and lidar odometry; Simultaneous localization and Mapping (SLAM).

MECH7021. Field and services robotics (6 credits)

This course covers the following topics: localization; map representation; 3D sensing, path planning and navigation; wheeled and legged robotic design and locomotion, gait planning and balance; hand and arm movement; grasping and manipulation; teleoperation; safety and robustness. Case studies on robots for agriculture, mining, search and rescue will be provided.

Notes: The examination-coursework assessment ratio: 40% to 100% for continuous assessment and 0% to 60% for examination