THE UNIVERSITY OF HONG KONG

Department of Data and Systems Engineering

MSc (RIS) List of course offered 2026-2027

DASE7099. Dissertation
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
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
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.

Mutually exclusive with: IDAT7223 Ergonomic design and multimedia technologies

DASE7137. Virtual reality and applications
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
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
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
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
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
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
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
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
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.

DASE7158. Human-computer interaction
Human–computer interaction (HCI) is a discipline concerned with the design, evaluation, and implementation of interactive computing systems for human use, as well as the study of the broader phenomena that shape their use and impact. This course introduces the fundamental concepts of HCI, including user experience, human-centered design, and an understanding of human capabilities and behavior. Topics include the history of interaction techniques, input devices, user interface design, virtual, augmented, and mixed reality, and emerging paradigms such as human–AI interaction. The course also covers design engineering practices and methods for evaluating interactive systems.

DASE7501. Robot modelling, planning and control
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. Robot sensing and intelligence
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
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
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
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.

DASE7506. Advanced machine learning methods
This course provides a detailed examination of various advanced topics in machine learning for industrial engineering, including four main directions: generative models; sequential decision making; physical AI; and large language model agents. It will cover a series of frontier topics, such as: diffusion models, flow-based models; reinforcement learning; robotic foundation models; large language models; agentic systems, etc. As the sequel to the course DASE 7140 Machine learning and applications, this course requires skills in Python programming, an understanding of core machine learning concepts, and knowledge of calculus, linear algebra, probability, and statistics—at an elementary level. DASE 7140 covers the first two prerequisites, so completing DASE 7140 is recommended but not required for enrolling in this course.

DASE7507. Frontiers in robotics and intelligent systems
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.

DASE7508. Security in intelligent systems
This course introduces the fundamental concepts and engineering techniques for securing intelligent systems. Topics include security principles and threat models; security of sensing, communication, computation and control; authentication, access control and secure communication; privacy, reliability and resilience of machine learning-enabled systems; monitoring, testing and assurance; and applications of secure intelligent systems in Internet of Things systems, cyber-physical systems, robotics, transportation, manufacturing and healthcare.

DASE7509. Artificial intelligence for system automation
This course introduces fundamental Artificial Intelligence (AI) methods and their applications in automated systems. Topics include AI architectures for system automation, machine learning for condition monitoring and fault diagnosis, deep learning for intelligent perception in automated systems, and reinforcement learning for automated system control. The course combines theoretical foundations with practical industrial case studies in robotics and manufacturing, together with hands-on programming experience in Python.

July 21, 2026