

■ Postgraduate

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SWINBURNE
UNIVERSITY OF
TECHNOLOGY

Advanced Manufacturing Technology

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Postgraduate programs in advanced manufacturing technology



Swinburne's postgraduate program in advanced manufacturing technology aims to maximise career opportunities and provide a comprehensive practical and theoretical understanding of key issues and technologies. These technologies create the tools that power a growing economy and contribute to the increase of living standards, while also making efficient transportation, advances in medical procedures and more powerful and sophisticated communications possible.

Using advanced manufacturing technologies, manufacturing efficiency and productivity can be enhanced by improving:

- flexibility and the ability to adapt to changing demand
- the effectiveness of equipment
- the effectiveness of skilled labour
- management quality
- the quality of products
- lead times and costs.

Areas of study in Swinburne's advanced manufacturing technology program include computer-aided design and manufacturing, robotics, technology management, work systems, sustainable design, advanced mechatronics and rapid manufacturing technologies. Students will also undertake elective units depending on their area of specialisation or interest.



Program at a glance

Advanced Manufacturing Technology	
Award	Graduate Certificate of Engineering (Advanced Manufacturing Technology) Master of Technology (Advanced Manufacturing Technology) Master of Engineering (Advanced Manufacturing Technology) Master of Engineering Science (Advanced Manufacturing Technology)
Focus	Implementing emerging manufacturing technologies in conjunction with strong management principles to improve manufacturing efficiency and productivity.
Suitable for	Recent engineering graduates and professional engineers in industry.
Average duration	Graduate Certificate – one semester (six months) full-time or equivalent part-time Master of Technology – two semesters (one year) full-time or equivalent part-time Master of Engineering – three semesters (18 months) full-time or equivalent part-time Master of Engineering Science – four semesters (two years) full-time or equivalent part-time
Location	Hawthorn campus
Entry requirements	A four-year Bachelor of Engineering in a relevant discipline, or pertinent industry experience. <i>Note: Applicants with other tertiary qualifications and relevant work experience may also apply and will be considered on a case-by-case basis. They may be granted entry into the graduate certificate or Master of Technology and on successful completion can continue into the Master of Engineering levels.</i>
Work experience	Preferred
Structure	Graduate Certificate – four units Master of Technology – eight units Master of Engineering – 12 units, or 10 units plus a masters project Master of Engineering Science (Advanced Manufacturing Technology) – 12 units plus a masters thesis, or 10 units plus a masters project and a masters thesis
2012 fees	\$2350 per unit (FEE-HELP is available for eligible domestic students)
Intake	February and August

Program details

Graduate Certificate of Engineering (Advanced Manufacturing Technology)

Master of Technology (Advanced Manufacturing Technology)

Master of Engineering (Advanced Manufacturing Technology)

Master of Engineering Science (Advanced Manufacturing Technology)

Swinburne's advanced manufacturing technology programs give students an understanding of specific advanced and emerging manufacturing technologies. Students will also gain the skills needed to implement these technologies in modern industry within both global and local contexts. It is expected that graduates will possess the skills to direct the design and implementation of specific technologies and processes addressed during the program.

This advanced manufacturing technology suite of programs aim to develop an understanding of:

- the principles of operation and characteristics of specific technologies and processes
- the context in which these technologies and processes can be implemented
- the impact of these technologies and processes on other aspects of manufacturing operations, and on products being manufactured
- how these technologies and processes affect the productivity of manufacturing operations
- the effect of technologies on global manufacturing and competitiveness
- the management tools required for effective operation of advanced manufacturing technologies.

Career opportunities

Graduates may find employment as design, manufacturing, production or systems engineers, engineering managers or research and development engineers in automotive companies, appliance manufacturers and other manufacturing companies intending to adopt advanced manufacturing technologies to enhance their productivity and competitive advantage in the global market.

Admission requirements

An overall average of 60 per cent in a four-year degree program in an engineering discipline, preferably in mechanical, manufacturing, electrical or electronic engineering from a recognised university for engineering education. Candidates with other tertiary qualifications and relevant industry experience will also be considered on a case-by-case basis.

Entry to the programs can be in first or second semesters.

Location

Hawthorn campus

Program length

Graduate Certificate: One semester (six months) of full-time study or equivalent part-time

Master of Technology: Two semesters (one year) of full-time study or equivalent part-time

Master of Engineering: Three semesters (18 months) of full-time study or equivalent part-time

Master of Engineering Science: Four semesters (two years) of full-time study or equivalent part-time

Program structure

Each unit of study is valued at 12.5 credit points unless otherwise indicated.

Graduate Certificate of Engineering (Advanced Manufacturing Technology)

To gain this qualification, students must satisfactorily complete four units of study to the value of 50 credit points comprising two discipline-specific units and a further two discipline-specific or elective units.

Master of Technology (Advanced Manufacturing Technology)

To gain this qualification, students must satisfactorily complete eight units of study to the value of 100 credit points comprising five discipline-specific units and a further three discipline-specific or elective units.

Master of Engineering (Advanced Manufacturing Technology)

To gain this qualification, students can complete either the coursework with masters project program, or coursework-only program.

a) Coursework with masters project

Students must complete 10 units, comprising six discipline-specific units and a further four discipline-specific or elective units, with the condition that either research unit HIT9010 or research unit HES7605 can be taken if selected as an elective, plus HIR513 Masters Project (25 credit points).

b) Coursework only

Students must complete 12 units, comprising seven discipline-specific units and a further five discipline-specific or elective units, with the condition that either research unit HIT9010 or research unit HES7605 can be taken if selected as an elective.

Master of Engineering Science (Advanced Manufacturing Technology)

In order to gain this qualification, students must satisfactorily complete all required units of Master of Engineering plus HIR514 Masters Thesis (50 credit points).

Units of study

Discipline-specific units (each 12.5 credit points)*	
HIR504	Advanced CAD/CAM
HIR505	Robotics in Manufacturing
HIR506	Technology Management
HIR507	Advanced Manufacturing Processes
HIR509	Computer Modelling Analysis and Visualisation
HES6120	Work Systems in Manufacturing
HES6121	Six Sigma
HES6122	Sustainable Design and Manufacture
HES6123	Advanced Mechatronics
HES6124	Nanofabrication Technologies
HES6126	Rapid Manufacturing and Tooling
HES6127	Surface Engineering
HES6128	Advanced Metal Forming
Recommended elective units (each 12.5 credit points)*	
HES6175	Project Costing
HES6175D	Project Costing (Distance mode)
HES6720	Risk Perception and Analysis (Distance mode)
HES6174	Resource Planning and Management
HES6199	Energy for the Future
HES6791	Project Management
HES6798	Procurement and Risk Management in Projects
HES7605	Research Design and Methodology** (Distance mode)
HIT9010	Research Methods**
Masters project units	
HIR513	Masters Project (25 credit points)
HIR514	Masters Thesis (50 credit points)

*Some may not be available every year.

**Either HES7605 or HIT9010 can be taken, and taken only in Stage 3.



Units of study outlines

Discipline-specific units

HES6120 Work Systems in Manufacturing

Students will develop an understanding of human-machine systems within advanced manufacturing environments. Topics may include work systems, methods engineering and layout planning, human factors of work, human-machine systems and work management, covering work organisation, worker motivation, job analysis and design.

HES6121 Six Sigma

The aim of this unit is to introduce the basic principles of quality management and Six Sigma-based tools and methodologies. Topics may include quality control and assurance, quality management systems, basic tools and techniques of quality assurance, quality standards, problem-solving, Six Sigma and quality assurance, Six Sigma and statistical control, Sigma Lean, waste elimination in manufacturing and engineering and asset management processes.

HES6122 Sustainable Design and Manufacture

This unit aims to provide an understanding of integrating environmentally conscious technologies in the modern manufacturing environment. The focus of this subject is on employing environmentally responsible systems for production in order to limit environmental impact. Topics may include design for the environment, air pollution and waste materials in manufacturing, disassembly for end life of products and energy storage.

HES6123 Advanced Mechatronics

This unit aims to provide an overview of trends in mechatronics engineering and is delivered at an appropriate level and depth for engineers. The focus is on the application of advanced control systems to mechatronic systems, sensors and actuators for mechatronics applications, vision applications and autonomous mobile robots.

HES6124 Nanofabrication Technologies

This unit aims to educate students in selecting appropriate nanofabrication methods for their research, and enable them to understand and evaluate methods of nanofabrication as needed to assess the potential impact (technological, economic and societal) of nanotechnologies and fabrication methods. Topics may include nanofabrication and nanolithography fundamentals, nano replication and manufacturing technologies, rapid prototyping, characterisation of nano structures – STM/AFM, Surface Raman Scattering, wettability (contact angle) measurements, small angle x-ray diffraction and electron diffraction, nano carbon tubes, nano wires, nano materials, nanoparticles, solgels and applications, nano devices and applications.

HES6126 Rapid Manufacturing and Tooling

In this unit, students will gain an understanding of the new technologies of rapid prototyping, rapid tooling, rapid manufacturing with industrial applications. Topics may include introduction to rapid prototyping/rapid manufacturing (RM), rapid prototyping process optimisation, emerging rapid manufacturing processes, advanced injection-moulding processes and simulation, material issues in RM: functionally graded materials, designed materials, direct and indirect rapid tooling (RT) techniques; applications of RM and RT: biomedical, automotive, aeronautical, construction.

HES6127 Surface Engineering

The aim of this unit is to develop expertise in advanced coating technologies with an emphasis on thermal spray, weld overlay and physical vapour deposition (PVD). Topics may include surface definition and the rationale for creating thin films and thick coatings, description of the thermal spray, welding, PVD processes, laser-surfacing processes, measurement techniques for analysing and characterising the nature of a surface, standards and proof-of-principle tests that are used for scientific and industrial qualification of modified surfaces, global perspective of 'surface coatings'; including economics, applications and the industrial economy.

HES6128 Advanced Metal Forming

This unit provides students with an understanding of the mechanics and various materials used in metal forming processes and the skills related to computational modeling of sheet forming process, which is widely used in modern metal forming industry. Topics may include nonlinear kinematics and anisotropic plasticity, experimental materials characterisation and constitutive parameters for modelling, instabilities including necking, buckling, springback, surface crack, modern forming limit (strain and stress-based) and fracture models to predict the instabilities, finite element modeling of sheet metal forming process, product design and optimisation methods.

Units of study outlines

HIR504 Advanced CAD/CAM

This unit aims to provide students with an understanding of the advanced aspects of computer-aided design (CAD) and computer-aided manufacturing (CAM). Students will develop skills in using CAD/CAM systems through practical, hands-on experience.

HIR505 Robotics in Manufacturing

Students will gain an understanding of the use of robots, automated guided vehicles and programmable logic controllers in the automation of manufacturing operations. The unit addresses the role of robotics in increasing manufacturing productivity and provides the knowledge and skills required to design robot-based manufacturing cells.

HIR506 Technology Management

The aim of this unit is to introduce manufacturing and engineering students to the basic principles of technology management. Students will gain an understanding of the nature, processes and sources of technology and innovations; project management; intellectual property rights; decision-making; and methods for integrating technology management and pioneering leadership in industrial environments.

HIR507 Advanced Manufacturing Processes

Providing a thorough coverage of industrial laser technology and applications, this unit develops an understanding of the basic physics of lasers and related processes and provides awareness of different laser materials.

HIR508 Intelligent Inspection Systems

Providing students with an appreciation of intelligent inspection systems and their applications to the manufacturing industry, this unit raises awareness of the trends in inspection technology development and their applications. Students will develop an understanding of the various sensing techniques available and how they are combined with other equipment and software to form inspection systems. They will also gain practical experience in the use of tools for inspection and measurement and acquire skills in the development of simple digital image processing software.

HIR509 Computer Modelling, Analysis and Visualisation

This unit provides students with an appreciation of the various CAD/CAM/CAE tools and their applications in the manufacturing industry. Students gain practical experience in the use of computer modelling and analysis software tools; develop an appreciation of surface modelling and its role in design in manufacturing; acquire an understanding of the basis of creating simple kinematic and robot workcell models; develop an understanding of the various modelling techniques available and how they are combined with experimental techniques; and gain awareness of advances in modelling and modelling techniques available to industry.

Masters project units

HIR513 Masters Project

In this unit, students have the opportunity to apply knowledge gained throughout the program to solve problems relevant to industry, by studying a real scenario, its analysis and improvements using the techniques learnt.

HIR514 Masters Thesis

Students will have the opportunity to conduct in-depth research into theory and techniques learned during the course, and apply it in solving relevant industry-based or applied research problems.

Recommended elective units

HES6174 Resource Planning and Management

This unit provides essential planning skills for the engineering and project management professional. On completion of this unit students should be able to conduct all of the necessary planning for the procurement of a major infrastructure or engineering facility. Topics include the use of excel for resource planning, network analysis precedence diagram method, resource planning with networks and non-networks, project monitoring and control, crashing program and inventory management, cost management, probability theory, project appraisal and risk assessment.

HES6175 Project Costing

This unit introduces students to project costing and project controls, focusing on civil engineering projects. It gives an overview of the main challenges and opportunities associated with project execution, risk, economics, estimating, tendering, planning and scheduling for project success. Factors that need to be familiar to and understood by project cost engineers are also outlined. This unit may be offered on campus or in distance education mode.

HES6199 Energy for the Future

The unit investigates what energy is, how understanding of energy is socially constructed and why it is essential to understanding sustainability; its properties and characteristics and how these are measured; conversion; forms and sources; primary and secondary; renewables; carbon content; electricity, fuels and the case of hydrogen.

HES6720 Risk Perception and Analysis

Students will gain an understanding of the process leading to injury, damage and loss and principles of risk estimation and assessment, and awareness of psychological and social issues relating to risk perception and reaction. The unit is normally offered in distance education mode.

HES6791 Project Management

This unit will provide students with a general understanding of the principles of management and leadership. Students will learn how to analyse an organisation's strengths and weaknesses and develop an understanding of organisational behaviour. They will study the fundamentals of project definition, planning and implementation, and learn about some of the important tools for project management.

HES6798 Procurement and Risk Management in Projects

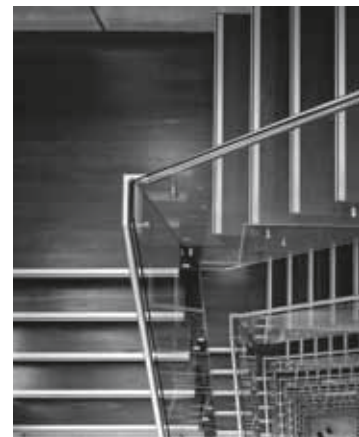
This unit addresses essential knowledge areas of procurement and risk management in project-based industries, as well as project/program settings in production/process-based industries. Topics may include procurement/project-delivery options; project-based contracting mechanisms; bidding/ tendering in project settings; source selection arrangements for project teams; relational frameworks (such as partnering and alliancing) and value networking in projects; project procurement through public-private partnerships; e-procurement fundamentals; mapping risks in different procurement routes and contractual arrangements; managing risks in international procurement, government/quasi-government projects and public-private partnerships; safety and security risks in project settings.

HES7605 Research Design and Methodology

This unit gives an introduction to the principles and processes involved in research practise. It is a skills-oriented unit, which means that the assignments enable students to develop the competencies needed to undertake a research investigation. The unit has been designed to assist students to make better use of human factors training, by enabling them to critically evaluate the basis upon which other researchers draw conclusions and make recommendations. Major modules in the unit include framing research in practice, designing research and conducting research. The unit is normally offered in distance education mode.

HIT9010 Research Methods

By the end of this unit students should be able to identify the basic principles and concepts of academic research. They will be able to interpret and critically evaluate previously published research in a formal literature review; describe the characteristic features of common research methods and debate their relative merits; identify a research question (or project problem/objective) and justify the selection of an appropriate and ethically managed research method; produce a written research/project proposal/report/paper and effectively present information in an oral presentation.



Key staff

Professor Syed Masood
Program Coordinator

Dr Amir Abdekhodae

Professor Chris Berndt

Dr Peter Higgins

Associate Professor Pio Iovenitti

Professor Ajay Kapoor

Professor Peter Kingshott

Professor Zhihong Man

Professor Yos Morsi

Professor Romesh Nagarajah

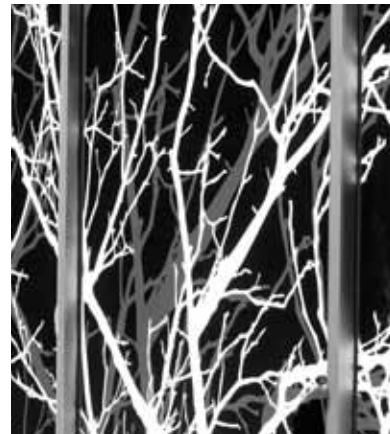
Dr Igor Sbarski

Associate Professor Soullis Tavrou

Professor Cuie Wen

Dr Yat Choi Wong

Professor Jeong Yoon



General information

Facilities

As a Swinburne student you will automatically gain access to a range of facilities. These include a well-resourced library, computer laboratories, fitness and health facilities, personal and career counselling, housing, employment and financial advice.

Fees for local students

In 2012, tuition fees for these programs are based on \$2350 per 12.5 credit point unit of study, with an annual fee of \$18,800 full-time and an overall program fee of \$28,200. In the event that a unit of study is derived from another program, the applicable fee will be that of the other program. All fees are reviewed each year and may increase without notice.

FEE-HELP is a government-funded loan that helps eligible fee-paying students pay their tuition fees. FEE-HELP is not available to New Zealand citizens and most holders of Australian permanent visas, however is available to Australian citizens and holders of a permanent humanitarian visa.

For further information visit www.goingtouni.gov.au

Application procedure

You may lodge your application at any time; however, each of the intake periods has an application submission closing date. Application forms can be obtained by phoning 1300 275 794 or visiting www.swinburne.edu.au/postgrad/apply

Applications must be accompanied by a certified copy of your passport or birth certificate, original transcripts of official results and a curriculum vitae.

For the next round of closing dates visit www.swinburne.edu.au/postgrad

International students

If you want to study at Swinburne but are not an Australian resident, contact Swinburne International:

1800 897 973 (within Australia)
+61 3 8676 7002 (outside Australia)
international@swinburne.edu.au
www.swinburne.edu.au/international

Recognition of Prior Learning

Recognition of Prior Learning (RPL) allows students to be granted credit or partial credit towards a qualification in recognition of skills and knowledge gained through work experience, tertiary qualifications and/or formal training. For more information visit www.swinburne.edu.au/rpl

Application closing dates

Semester 1 – Early February

Semester 2 – Mid July

Visit www.swinburne.edu.au/studentoperations/calendar for current semester dates.

Further information

Telephone: 1300 275 794

Email: postgrad@swinburne.edu.au

Website: www.swinburne.edu.au/engineering

Information sessions

Information sessions are held regularly throughout the year. They are a great opportunity to meet and talk to staff about your postgraduate study options.

The sessions help you understand what your chosen postgraduate program entails – what you can learn and what your study options are and where your qualification may take you.

For session dates visit www.swinburne.edu.au/postgrad

■ ANY QUESTIONS?

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■ CAMPUSES

Hawthorn campus
John Street, Hawthorn

Prahran campus
144 High Street, Prahran

Lilydale campus
Melba Avenue, Lilydale

Croydon campus
12-50 Norton Road, Croydon

Wantirna campus
369 Stud Road, Wantirna

Sarawak campus
Kuching, Sarawak, Malaysia



CRICOS Provider Code: 00111D

The information contained in this course guide was correct at the time of publication, September 2011. The university reserves the right to alter or amend the material contained in this guide. The information in this guide does not apply to international students. For information about courses for international students please go to www.swinburne.edu.au/international

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