

# MECHANICAL AND INDUSTRIAL ENG. (MECH)

## MECH 2001 Kinematics and Kinetics of Machines (10 Credit Points)

Subject Details (<https://hbook.westernsydney.edu.au/subject-details/mech2001/>) **Legacy Code:** 300035

Kinematics is the study of the motion of objects, and Kinetics is the study of the causes of the motion. The focus for this subject is on rigid body kinematics which involves the study of a solid body with little or no deformation in planar motion, such as those in machines. The motion of key machine components and the forces they generate gives rise to design problems. Students gain an understanding of the relevance of kinematics and kinetics in the analysis and design of mechanical systems and of methods to ensure machines operate efficiently and safely.

**Level:** Undergraduate Level 2 subject

**Pre-requisite(s):** MATH 1016 AND ENGR 1018

**Equivalent Subjects:** MECH 2002 Kinematics and Kinetics of Machines (WSTC AssocD)

**Restrictions:** Please see the Subject Details page for any restrictions for this subject

## MECH 2002 Kinematics and Kinetics of Machines (WSTC AssocD) (10 Credit Points)

Subject Details (<https://hbook.westernsydney.edu.au/subject-details/mech2002/>) **Legacy Code:** 700244

Kinematics is the study of the motion of objects, and Kinetics is the study of the causes of the motion. The focus for this subject is on rigid body kinematics, which involves the study of a solid body with little or no deformation in planar motion, such as those in machines. The motion of key machine components and the forces they generate gives rise to design problems. Students gain an understanding of the relevance of kinematics and kinetics in the analysis and design of mechanical systems and of methods to ensure machines operate efficiently and safely.

**Level:** Undergraduate Level 2 subject

**Pre-requisite(s):** MATH 1017 AND ENGR 1019

**Equivalent Subjects:** MECH 2001 - Kinematics and Kinetics of Machines

**Restrictions:** Please see the Subject Details page for any restrictions for this subject

## MECH 2003 Mechanics of Materials (10 Credit Points)

Subject Details (<https://hbook.westernsydney.edu.au/subject-details/mech2003/>) **Legacy Code:** 300040

Mechanics of Materials is the study of the stresses and deformation of a body made of any elastic solid material, and how these are related to the body's shape and the load applied to it. This subject looks at how and why structural components including bars and beams deform and break. It concentrates on how these are affected by the geometry of the body and loading. Types of loadings considered include normal loads, torsional loads and bending loads. The main objective of the subject is to introduce students to the aspects of stress, strain and internal force development in the components and the methods to determine the deformation and deflections of the components. Energy methods and impact loadings are also considered.

**Level:** Undergraduate Level 2 subject

**Pre-requisite(s):** ENGR 1018

**Equivalent Subjects:** LGYA 5707 Mechanics and Materials MECH 2004 Mechanics of Materials (WSTC Assoc Deg)

**Restrictions:** Please see the Subject Details page for any restrictions for this subject

## MECH 2004 Mechanics of Materials (WSTC AssocD) (10 Credit Points)

Subject Details (<https://hbook.westernsydney.edu.au/subject-details/mech2004/>) **Legacy Code:** 700116

Mechanics of Materials is the study of the stresses and deformation of a body made of any elastic solid material and how these are related to the body's shape and the load applied to it. This subject looks at how and why structural components including bars and beams deform and break. It concentrates on how these are affected by the geometry of the body and loading. Types of loadings considered include normal loads, torsional loads and bending loads. The main objective of the subject is to introduce students to the aspects of stress, strain and internal force development in the components and the methods to determine the deformation and deflections of the components. Energy methods and impact loadings are also considered. Offerings of alternate subjects are dependent on there being sufficient student enrolment numbers. If enrolments are low, the College may cancel delivery of the alternate subject.

**Level:** Undergraduate Level 2 subject

**Pre-requisite(s):** ENGR 1019

**Equivalent Subjects:** MECH 2003 - Mechanics of Materials

**Restrictions:** Please see the Subject Details page for any restrictions for this subject

## MECH 2005 Mathematics for Mechanical and Mechatronic Engineers (10 Credit Points)

Subject Details (<https://hbook.westernsydney.edu.au/subject-details/mech2005/>) **Legacy Code:** 301342

This subject will be offered at Engineering Innovation Hub - Hassall St, Parramatta campus. This subject introduces mathematical tools and analytical reasoning useful for a wide range of professions, as well as highlighting mathematical foundations that have contributed to advances in engineering. The course content focuses more on useful concepts at the core of applied mathematics rather than theoretical mathematics. Students learn a range of concepts and methods from applied mathematics and how these apply to various fields of engineering.

**Level:** Undergraduate Level 2 subject

**Pre-requisite(s):** MATH 1035

**Restrictions:** Please see the Subject Details page for any restrictions for this subject

## MECH 3001 Advanced Dynamics (10 Credit Points)

Subject Details (<https://hbook.westernsydney.edu.au/subject-details/mech3001/>) **Legacy Code:** 300763

This subject covers the analysis and control of dynamical behaviour of mechanical systems. It discusses the fundamental principles in controlling mechanical dynamic systems. In particular, the subject will cover contents in: multi-degree of freedom vibration analysis and modelling; open and closed loop systems; transfer function and state variable methods in mechanical system modelling; concepts of stability; design and analyse control systems using root-locus, bode diagram and state-space methods for mechanical systems.

**Level:** Undergraduate Level 3 subject

**Pre-requisite(s):** MECH 3004 OR MECH 2001

**Incompatible Subjects:** ENGR 3006 - Control Systems

**Restrictions:** Please see the Subject Details page for any restrictions for this subject

**MECH 3002 Advanced Mechanics of Materials (10 Credit Points)**

Subject Details (<https://hbook.westernsydney.edu.au/subject-details/mech3002/>) **Legacy Code:** 300761

This subject builds on the Mechanics of Materials to provide students with knowledge about impacts of deformation, stresses, strains and strength on materials and components essential in understanding how to improve mechanical design. Students' analytic and problem solving skills are developed through analysis of impacts including non-elastic deformation, orientation of the reference axes, and how materials fail. Using knowledge about materials, students evaluate impacts on materials, the mechanisms to control properties of materials, and use mathematical calculations and techniques to determine stresses and strains on simple components. Overall, students develop the capacity to select appropriate materials and improve mechanical design.

**Level:** Undergraduate Level 3 subject

**Pre-requisite(s):** MECH 2003

**Restrictions:** Please see the Subject Details page for any restrictions for this subject

**MECH 3004 Dynamics of Mechanical Systems (10 Credit Points)**

Subject Details (<https://hbook.westernsydney.edu.au/subject-details/mech3004/>) **Legacy Code:** 300480

This subject looks at how non-rigid components deform and oscillate. It looks at undamped and damped systems undergoing free vibration, steady state forced vibration and transient forced vibration. The principles of virtual work are used to investigate the equilibrium and dynamics of mechanisms.

**Level:** Undergraduate Level 3 subject

**Pre-requisite(s):** MECH 2001 AND MECH 2003

**Equivalent Subjects:** LGYA 5694 - Dynamics and Mechanical Systems

**Restrictions:** Please see the Subject Details page for any restrictions for this subject

**MECH 3005 Mechanical Design (10 Credit Points)**

Subject Details (<https://hbook.westernsydney.edu.au/subject-details/mech3005/>) **Legacy Code:** 300764

This subject introduces students to the design of machine components providing a link between engineering science and practice. Students will examine the design of machine components to ensure their functionality, strength and durability in order to identify and provide innovative solutions to complex real-world problems. Knowledge gained in this subject will benefit students aspiring to careers in mechanical and mechatronic engineering.

**Level:** Undergraduate Level 3 subject

**Pre-requisite(s):** MECH 2003 AND MECH 2001

**Equivalent Subjects:** MECH 3003 - Design of Servo-Systems

**Restrictions:** Please see the Subject Details page for any restrictions for this subject

**MECH 3006 Mechatronic Design (10 Credit Points)**

Subject Details (<https://hbook.westernsydney.edu.au/subject-details/mech3006/>) **Legacy Code:** 300487

Through practical lab exercises and a design project, students will integrate basic skills of mechanics, mechanical systems, and automation in the practice of engineering design (Design for X and system engineering) as applied to mechatronic devices and systems. Students will perform detailed design analysis on important machine elements such as bearings, brakes, clutches, shaft, motor and to integrate those elements to form an automatic mechatronic system is the intended outcome of undertaking this unit. The project-based tasks incorporated into this program build team work experience as well as each student's individual capabilities.

**Level:** Undergraduate Level 3 subject

**Pre-requisite(s):** MECH 2003

**Equivalent Subjects:** LGYA 5708 - Mechatronic Design 1 LGYA 5709 - Mechatronic Design 2

**Restrictions:** Please see the Subject Details page for any restrictions for this subject

**MECH 3007 Thermal and Fluid Engineering (10 Credit Points)**

Subject Details (<https://hbook.westernsydney.edu.au/subject-details/mech3007/>) **Legacy Code:** 300759

The subject provides an understanding of thermo-fluid principles and their engineering applications related to career pathways in manufacturing, renewable energy, human health and the environment. In addition to examining theoretical principles, students' analytical skills are developed as they evaluate thermal and fluid systems and apply basic computational techniques to solve problems in practical laboratory sessions. Students will explore topics such as aerodynamics, hydrodynamics, turbomachinery, combustion, and ventilation to develop industry applicable, practical skills.

**Level:** Undergraduate Level 3 subject

**Pre-requisite(s):** CIVL 2003 AND MECH 3008

**Restrictions:** Please see the Subject Details page for any restrictions for this subject

**MECH 3008 Thermodynamics and Heat Transfer (10 Credit Points)**

Subject Details (<https://hbook.westernsydney.edu.au/subject-details/mech3008/>) **Legacy Code:** 300760

This subject introduces students to the fundamentals of thermodynamics which involves energy in the form of heat and heat transfer. Students explore the basic laws and properties of thermodynamics to discover how energy is converted and transferred. Students will apply their knowledge to evaluate power and refrigeration cycles, industrial devices, as well as to design a simple industrial device.

**Level:** Undergraduate Level 3 subject

**Pre-requisite(s):** MATH 1019 AND ENGR 1011 OR ENGR 1028

**Restrictions:** Please see the Subject Details page for any restrictions for this subject

**MECH 3009 Thermodynamics and Heat Transfer (WSTC AssocD) (10 Credit Points)**

Subject Details (<https://hbook.westernsydney.edu.au/subject-details/mech3009/>) **Legacy Code:** 700312

This subject introduces students to the fundamentals of thermodynamics which involves energy in the form of heat and heat transfer. Students explore the basic laws and properties of thermodynamics to discover how energy is converted and transferred. Students will apply their knowledge to evaluate power and refrigeration cycles, industrial devices, as well as to design a simple industrial device. Offerings of alternate subjects are dependent on there being sufficient student enrolment numbers. If enrolments are low, the College may cancel delivery of the alternate subject.

**Level:** Undergraduate Level 3 subject

**Pre-requisite(s):** ENGR 1012 AND

MATH 1017 AND

LGYB 0486

**Equivalent Subjects:** MECH 3008 - Thermodynamics and Heat Transfer

**Restrictions:** Please see the Subject Details page for any restrictions for this subject

**MECH 4001 Computational Fluid Dynamics (10 Credit Points)**

Subject Details (<https://hbook.westernsydney.edu.au/subject-details/mech4001/>) **Legacy Code:** 300999

This subject introduces students to the fundamentals of computational fluid dynamics. The subject covers the conventional methods for solving the ordinary and partial differential equations. The numerical method for solving the inviscid flow and the viscous flow problems will be introduced. The students learn the application of the commercial software in the engineering problems.

**Level:** Undergraduate Level 4 subject

**Pre-requisite(s):** ELEC 1006 AND

MECH 3007

**Restrictions:** Please see the Subject Details page for any restrictions for this subject

**MECH 4002 Computer Aided Engineering (10 Credit Points)**

Subject Details (<https://hbook.westernsydney.edu.au/subject-details/mech4002/>) **Legacy Code:** 301000

This subject describes the basics and fundamentals of computer aided engineering focusing on the advanced topics of finite element methods, which is a powerful numerical tool for analysing a wide range of engineering problems. Through applied projects students will apply the finite element method (FEM)-based computer aided engineering (CAE) and its applications in the fields of solid mechanics, fluid mechanics, thermodynamics and heat transfer and product design and development as well. The development of students' academic skills in research and communication are also achieved through the completion of FEM-based CAE projects.

**Level:** Undergraduate Level 4 subject

**Pre-requisite(s):** ENGR 3020

**Restrictions:** Please see the Subject Details page for any restrictions for this subject

**MECH 4003 Mobile Robotics (10 Credit Points)**

Subject Details (<https://hbook.westernsydney.edu.au/subject-details/mech4003/>) **Legacy Code:** 300043

To develop an understanding of the basic concepts involved in Mobile Robotics. The areas of mobile robot mechanics, localisation, map building and path planning of mobile robots will be introduced. Various sensors and their applications in mobile robotics are also to be introduced.

**Level:** Undergraduate Level 4 subject

**Pre-requisite(s):** ENGR 1018

**Restrictions:** Please see the Subject Details page for any restrictions for this subject

**MECH 4004 Robotics (10 Credit Points)**

Subject Details (<https://hbook.westernsydney.edu.au/subject-details/mech4004/>) **Legacy Code:** 300056

The aim of this subject is to develop an understanding of the basic concepts involved in Robotics. The kinematics, dynamics, control and sensing aspects in robotics will be introduced. In addition, the concepts of artificial intelligence (AI) and their applications in robotics will also be introduced. There will be considerable use of MATLAB in the subject.

**Level:** Undergraduate Level 4 subject

**Pre-requisite(s):** MECH 3004

**Restrictions:** Please see the Subject Details page for any restrictions for this subject

**MECH 4005 Advanced Engineering Thesis 1: Preliminary Investigations (10 Credit Points)**

Subject Details (<https://hbook.westernsydney.edu.au/subject-details/mech4005/>) **Legacy Code:** 300969

Advanced Engineering Thesis 1 - Preliminary Investigations subject consists of a research project designed and implemented under the direction of an academic supervisor and research mentor. This subject is the culmination of studies for students who have completed their first three years of an undergraduate degree and provides substantial training in Preliminary Investigations. Under staff supervision, students are allocated a particular topic for their research, design their own programme of research, and perform the research. The emphasis of this subject is on the application of research knowledge gained in other subjects to the practical conduct of the individual research project. This subject provides final year Advanced engineering students with the opportunity to undertake research on a specialist topic within their Key Program of undergraduate study.

**Level:** Undergraduate Level 4 subject

**Restrictions:** Please see the Subject Details page for any restrictions for this subject

**MECH 4006 Advanced Engineering Thesis 2: Detailed Investigations (10 Credit Points)**

Subject Details (<https://hbook.westernsydney.edu.au/subject-details/mech4006/>) **Legacy Code:** 300970

Advanced Engineering Thesis 2 - Detailed Investigations unit consists of a research project designed and implemented under the direction of an academic supervisor and research mentor. This unit is the culmination of studies for students who have completed their first three years of an undergraduate degree and provides substantial training in detailed Investigations. Under staff supervision, students are allocated a particular topic for their research, design their own programme of research, and perform the research. The emphasis of this unit is on the application of research knowledge gained in other units and in Engineering Thesis 1 - Preliminary Investigations to the practical conduct of the individual research project. This unit provides final year Advanced engineering students with the opportunity to undertake research on a specialist topic within their Key Program of undergraduate study.

**Level:** Undergraduate Level 4 subject

**Pre-requisite(s):** MECH 4005

**Restrictions:** Please see the Subject Details page for any restrictions for this subject

**MECH 5001 Vertical Transportation Technology (10 Credit Points)**

Subject Details (<https://hbook.westernsydney.edu.au/subject-details/mech5001/>)

As technology, architecture and building construction advance, vertical transportation systems must keep up to ensure best performance of systems in terms of safety, sustainability, passenger comfort and accessibility. This subject addresses the complexity of integrating systems to ensure best performance in specific contexts and for multiple stakeholders. Students work on projects and use computer-aided design (CAD) to develop design solutions that maximise performance while meeting requirements. In doing so, students further develop their technical and professional communication skills. Knowledge gained in this subject will benefit students aspiring to careers such as system, electrical and mechanical design of vertical transportation.

**Level:** Postgraduate Coursework Level 5 subject

**Restrictions:** Please see the Subject Details page for any restrictions for this subject

**MECH 5002 Fundamentals of Vertical Transportation Systems (10 Credit Points)**

Subject Details (<https://hbook.westernsydney.edu.au/subject-details/mech5002/>)

Vertical transportation, which includes lifts and escalators, has undergone significant changes over the last 10 years. This subject provides an overview of these changes and introduces current requirements that are essential for the safety and flow of people in and around different building types and systems. Students learn various technical and engineering aspects of vertical transportation systems and evaluate designs in relation to compliance with regulations and standards. Knowledge gained in this subject will benefit students aspiring to careers such as vertical transportation planning, design and installation.

**Level:** Postgraduate Coursework Level 5 subject

**Restrictions:** Please see the Subject Details page for any restrictions for this subject

**MECH 5003 Vertical Transportation Operations and Management (10 Credit Points)**

Subject Details (<https://hbook.westernsydney.edu.au/subject-details/mech5003/>)

The focus in this subject is on integrating the electrical and mechanical elements as part of selecting a suitable vertical transportation system in line with the standards and regulations. In making the selection, students create layouts, use simulation and methods of calculation. Students then determine an appropriate maintenance plan. Students are encouraged to assess their professional development needs given the integration of different engineering disciplines in the context of vertical transportation, as well as to evaluate their performance in group work. Knowledge gained in this subject will benefit students aspiring to careers such as vertical transportation operations, maintenance and service.

**Level:** Postgraduate Coursework Level 5 subject

**Restrictions:** Please see the Subject Details page for any restrictions for this subject

**MECH 7001 Advanced Computational Fluid Dynamics (10 Credit Points)**

Subject Details (<https://hbook.westernsydney.edu.au/subject-details/mech7001/>) **Legacy Code:** 301023

This subject introduces students to commonly used numerical methods used in computational fluid dynamics (CFD). The subject covers the theory and the application of CFD for solving engineering problems. The numerical methods for solving the in viscid flow and the viscous flow problems will be introduced. The students learn the application of the engineering software in the engineering problems.

**Level:** Postgraduate Coursework Level 7 subject

**Restrictions:** Please see the Subject Details page for any restrictions for this subject

**MECH 7002 Advanced Computer Aided Engineering (10 Credit Points)**

Subject Details (<https://hbook.westernsydney.edu.au/subject-details/mech7002/>) **Legacy Code:** 301022

This subject focuses on advanced topics in computer aided engineering and their applications in mechanical engineering in analysing a wide range of engineering problems. The objective of this subject is to advance students' knowledge and skill level on the finite element method (FEM)-based computer aided engineering (CAE) and its advanced applications in the fields of solid mechanics, fluid mechanics, thermodynamics and heat transfer and product design and development as well. Academic skills on research and communication are ensured to be achieved through conducting FEM-based CAE projects.

**Level:** Postgraduate Coursework Level 7 subject

**Restrictions:** Please see the Subject Details page for any restrictions for this subject

**MECH 7003 Advanced Dynamic Systems (10 Credit Points)**

Subject Details (<https://hbook.westernsydney.edu.au/subject-details/mech7003/>) **Legacy Code:** 301019

This subject covers three-dimensional kinematics and kinetics of a rigid body. The principles of virtual work are used to investigate the equilibrium and dynamics of mechanisms. Some key aspects of mechanical vibrations are introduced, including vibration response, vibration isolation and vibration measurement.

**Level:** Postgraduate Coursework Level 7 subject

**Restrictions:** Please see the Subject Details page for any restrictions for this subject

**MECH 7004 Advanced Mobile Robotics (10 Credit Points)**

Subject Details (<https://hbook.westernsydney.edu.au/subject-details/mech7004/>) **Legacy Code:** 301020

This subject is designed to develop an understanding of the concepts involved in Mobile Robotics. The areas of mobile robot mechanics, localisation, map building and path planning will be introduced. Various sensors and their applications in mobile robotics are also to be introduced.

**Level:** Postgraduate Coursework Level 7 subject

**Restrictions:** Please see the Subject Details page for any restrictions for this subject

**MECH 7005 Advanced Robotics (10 Credit Points)**

Subject Details (<https://hbook.westernsydney.edu.au/subject-details/mech7005/>) **Legacy Code:** 300599

This subject is designed to introduce the engineering concepts involved in Robotics. The kinematics, dynamics, control and sensing aspects in robotics will be introduced. In addition, the concepts of artificial intelligence and their applications in robotics will also be discussed and assessed.

**Level:** Postgraduate Coursework Level 7 subject

**Incompatible Subjects:** LGYA 5817 - Advanced Robotics LGYA 5833 - Mobile Robotic Systems

**Restrictions:** Please see the Subject Details page for any restrictions for this subject

**MECH 7006 Advanced Thermal and Fluid Engineering (10 Credit Points)**

Subject Details (<https://hbook.westernsydney.edu.au/subject-details/mech7006/>) **Legacy Code:** 301021

This subject covers fundamental principles in the thermal and fluid engineering. While the main focus will remain on incompressible fluids, effects of compressible fluids will also be discussed. The contents of this subject include fluid mechanics, thermodynamics and heat transfer. Students will learn the engineering applications of thermal and fluid principles.

**Level:** Postgraduate Coursework Level 7 subject

**Restrictions:** Please see the Subject Details page for any restrictions for this subject

**MECH 7007 Mechanical System Design (10 Credit Points)**

Subject Details (<https://hbook.westernsydney.edu.au/subject-details/mech7007/>) **Legacy Code:** 301018

This subject advances students understanding on product design and development of machine components and assemblies using systems engineering approaches. The subject covers a review on the design of main components of machinery to ensure their functionality, strength and durability, which includes drive components - gears, shafts, belt drives, and bearings, and structural components - welds and treaded fasteners. The machine assembly design is delivered based on systems engineering. Academic skills on research and communication are ensured to be achieved through conducting systems engineering approached-based mechanical system design projects.

**Level:** Postgraduate Coursework Level 7 subject

**Restrictions:** Please see the Subject Details page for any restrictions for this subject

**MECH 7008 Mechatronic System Design (10 Credit Points)**

Subject Details (<https://hbook.westernsydney.edu.au/subject-details/mech7008/>) **Legacy Code:** 300600

This subject will advance the skills of mechanics, mechanical systems and automation in the practice of engineering design as applied to mechatronic devices and systems. The ability to perform detailed design analysis of machine elements as well as control systems as applicable to manufacturing and process machinery is the intended outcome of undertaking this subject and project-based tasks will form part of the learning process and team work experience.

**Level:** Postgraduate Coursework Level 7 subject

**Incompatible Subjects:** LGYA 6106 - Servo Systems Design (PG) LGYA 5832 - Mechatronic System Design

**Restrictions:** Please see the Subject Details page for any restrictions for this subject

**MECH 9001 Higher Degree Research Thesis - Engineering (Industrial Design) (10,20 Credit Points)**

Subject Details (<https://hbook.westernsydney.edu.au/subject-details/mech9001/>) **Legacy Code:** 800063

**Level:** PhD and Research Masters Level 9 subject

**Restrictions:** Please see the Subject Details page for any restrictions for this subject

**MECH 9002 Higher Degree Research Thesis - Engineering (Mechanical) (10,20 Credit Points)**

Subject Details (<https://hbook.westernsydney.edu.au/subject-details/mech9002/>) **Legacy Code:** 800185

**Level:** PhD and Research Masters Level 9 subject

**Restrictions:** Please see the Subject Details page for any restrictions for this subject