Bachelor of Engineering (Aerospace Avionics) (EN40)

Year offered: 2011
Admissions: Yes
CRICOS code: 056529D
Course duration (full-time): 4 years
Domestic Fees (indicative): 2011: CSP $3,878 (indicative) per semester
International Fees (indicative): 2011: $12,000 (indicative) per semester
Domestic Entry: February and July
International Entry: February and July
QTAC code: 412502
Past rank cut-off: 81
Past OP cut-off: 10
OP Guarantee: Yes
Assumed knowledge: English (4, SA) and Maths B (4, SA)
Preparatory studies: For information on acquiring assumed knowledge visit http://www.qut.edu.au/assumed-knowledge
Total credit points: 384
Standard credit points per full-time semester: 48
Course coordinator: Dr R. Mahalinga-Iyer
Discipline coordinator: Dr Felipe Gonzalez
Campus: Gardens Point

Why choose this course?
The Bachelor of Engineering (Aerospace Avionics) is a unique course in Australia.

Career outcomes
As an Aerospace Avionics graduate you will be involved in leading edge technology in an international industry, there are career opportunities with government bodies, the Defence Forces, aerospace and aeronautical companies.

Practical teaching
You will be involved in real world hands-on activities such as; building a satellite; a flight simulator; a UAV (Unmanned Aerial Vehicle); a guided rocket

Industry links
The course has close links with relevant local and overseas industries. Many of the teaching staff are involved in research with government and industry sectors, ensuring the program is relevant to industry and giving you the opportunity to work on real projects during your studies.

Course structure
You will learn about aerodynamics, aircraft control systems, avionics navigation, satellite technology and communication systems.

Facilities / technology
You will have first-hand experience of the latest technologies used in the industry. Experiential and practical learning opportunities are provided through specially designed learning environments that integrate virtual and web based material with physical equipment to ensure that you have the opportunity to learn by doing which is an important part of engineering education.

Convenience
You will study at QUT's Gardens Point campus in the centre of Brisbane, within easy walking distance to public transport, including buses, trains and ferries.

Who should do this course?
If you are interested in any of the following, you may enjoy a career in Aerospace Avionics:
- How things work.
- Space and flight.
- Technology and electronics.

Recommended Study
Chemistry, Math C and Physics.

Professional Recognition
Full professional accreditation from Engineers Australia has been given for this course.

Minors
For professional recognition you will undertake an Applications minor which consists of a Work Place Integrated Learning unit, a project unit and two specialised engineering units.

Special Course Requirements
Students must complete 60 days approved industrial experience in an engineering environment, including 10 days specialist experience in the avionics industry as part of the Work Integrated Learning unit.

International Student Entry
International students must maintain an enrolment program that will allow them to complete their course within the specified timeframe of their eCoE (electronic Confirmation of Enrolment).

Deferment
Domestic students can defer their offer in this course for one year. In exceptional circumstances up to 12 months of additional deferment may be granted.

Find out more on deferment.

Limits on grades of 3
A new policy concerning grades of 3 came into effect from 1 January 2009 (QUT MOPP C/5.2). With effect from this date grades of 3 are no longer considered a conceded or low pass but are classified as a fail grade. Any grades of 3 awarded prior to 1 January 2009 retain the conceded pass status and will be counted for graduation purposes up to the maximum number of grades of 3 permitted for your course. Grades of 3 incurred in units that commence after 1 January 2009 will not count towards your degree. Further information is available on the Student Services website.

Further Information
School of Engineering Systems - Phone +61 7 3138 1993, Fax +61 7 3138 1516, email: bee.enquiries@qut.com

Full-time Course structure - Students commencing February 2010 onwards (Years 2 - 4)

Please Note:
For 1st year enrolment program please refer to EN40 Bachelor of Engineering course entry.

Year 2 - Semester 1 (to be introduced in 2011)
- ENB240 Introduction To Electronics
- ENB246 Engineering Problem Solving
- ENB250 Electrical Circuits
- MAB127 Mathematics for Engineering 2
  OR
- MAB233 Engineering Mathematics 3

Year 2 - Semester 2 (to be introduced in 2011)
- ENB121 Aerodynamics
- ENB242 Introduction To Telecommunications
- ENB243 Linear Circuits and Systems
- ENB244 Microprocessors and Digital Systems

Year 3 - Semester 1 (to be introduced in 2012)
- ENB241 Software Systems Design
- ENB342 Signals, Systems and Transforms
- ENB348 Aircraft Systems and Flight Control
- ENB354 Introduction To Systems Design

Year 3 - Semester 2 (to be introduced in 2012)
- ENB343 Fields, Transmission and Propagation
- ENB347 Modern Flight Control Systems
- ENB355 Advanced Systems Design
- MAB233 Engineering Mathematics 3
  OR
- Selective

Year 4 - Semester 1 (to be introduced in 2013)
- BEB801 Project 1
- ENB346 Digital Communications
- ENB440 RF Techniques and Modern Applications
- ENB451 Aerospace Radio and Radar Systems

Year 4 - Semester 2 (to be introduced in 2013)
- BEB701 Work Integrated Learning 1
- BEB802 Project 2
- ENB357 Spacecraft Guidance and Control
- ENB447 Navigation Systems For Aircraft

Aerospace Avionics Selectives
- ENB344 Industrial Electronics
- ENB448 Signal Processing and Filtering
- ENB457 Controls, Systems and Applications
- INB270 Programming

Potential Careers:
Aerospace Avionics Engineer, Electrical and Computer Engineer, Electrical Engineer, Engineer.

UNIT SYNOPSISES

BEB701 WORK INTEGRATED LEARNING 1
This unit aims to provide you with the opportunity to learn in a workplace environment. It will involve attendance, participation, observation, critical reflection, and report writing on workplace activities. The emphasis of your critical reflection and report writing will be on identifying and describing aspects of professional relevance incorporating: collaboration and teamwork; work place, health and safety; professional conduct; ethical responsibility, and other aspects of your work place experience. This unit may form part of your (compulsory) course core (as required by professional accrediting bodies e.g. Engineers Australia, Australian Institute of Building, Royal Institution of Chartered Surveyors), or it may be one of several work integrated learning (WIL) units (selected as...
Module Electronics A provides a basic understanding of the characteristics and operation of discrete semiconductor components. Electronic circuit design is introduced with emphasis on the small signal low and high frequency response of those circuits. Module Digital Electronics gives students a good grounding in the basic principles of digital design, with particular regard to the fundamentals of digital number systems, Boolean algebra, combinational and sequential logic design.

**Prerequisites:** ENB103 or ENB120  
**Equivalents:** EEB312  
**Credit points:** 12  
**Contact hours:** 5 per week  
**Campus:** Gardens Point  
**Teaching period:** 2011 SEM-1

**ENB241 SOFTWARE SYSTEMS DESIGN**

The unit introduces students to Software Engineering by considering a whole Software Lifecycle. Each step of the lifecycle is treated in detail, such as concept phase, requirement definition, software design, human-computer interaction, implementation, audits, and maintenance. Software design principles and techniques are presented as well as real-time system design. CASE development tools are briefly introduced as well as object oriented programming for which a structured Object Oriented Analysis and Design are considered.

**Prerequisites:** ENB246 or INB104  
**Equivalents:** EEB612  
**Credit points:** 12  
**Contact hours:** 4 per week  
**Campus:** Gardens Point  
**Teaching period:** 2011 SEM-2

**ENB242 INTRODUCTION TO TELECOMMUNICATIONS**

Telecommunications systems and the principles underlying their operations are introduced starting from mathematical preliminaries such as the Fourier series and the Fourier transform. Analogue modulation techniques (AM and FM), systems and circuits for generation and demodulation, analogue to digital conversion, pulse modulation and baseband digital data communication techniques are studied using time and frequency domain analyses.

**Prerequisites:** (ENB120 or ENB103) and (MAB126 or MAB110 or MAB111)  
**Equivalents:** EEB340  
**Credit points:** 12  
**Contact hours:** 3 per week  
**Campus:** Gardens Point  
**Teaching period:** 2011 SEM-1 and 2011 SEM-2

**ENB243 LINEAR CIRCUITS AND SYSTEMS**

Network analysis; Laplace transform of signals and transfer functions of systems, time and frequency responses of linear circuits, feedback configurations and transfer functions, analyse and designing analogue systems using transistors and operational amplifiers, designing and synthesising analogue filters, signal conditioning.

**Prerequisites:** ENB120 and MAB126  
**Assumed knowledge:** ENB240 is assumed knowledge.  
**Credit points:** 12  
**Contact hours:** 4 per week  
**Campus:** Gardens Point  
**Teaching period:** 2011 SEM-2
ENB244 MICROPROCESSORS AND DIGITAL SYSTEMS
This unit covers the basis for electronic circuit design in general but also in connection with microprocessor systems, theory and design of advanced embedded digital systems and practical implementation. The practical application of these circuits including interfacing and environment factors will be considered.
Prerequisites: ENB240  Assumed knowledge: ENB246 or INB104 is assumed knowledge.  Credit points: 12
Contact hours: 4 per week  Campus: Gardens Point  Teaching period: 2011 SEM-2

ENB246 ENGINEERING PROBLEM SOLVING
This unit introduces students to the use of computers as tools for solving engineering problems. MATLAB is introduced as a numerical computing environment with the capacity to support complex mathematics and to be programmed to solve specific engineering problems. Stand alone application development using C++ is introduced as a means of exposing students to the high and low level computer programming concepts that are necessary to the implementation of engineering solutions in hardware specific programming environments.
Assumed knowledge: MAB126 or MAB180 or MAB131, and ENB103 or ENB120 is assumed knowledge.  Credit points: 12  Contact hours: 4 per week  Campus: Gardens Point  Teaching period: 2011 SEM-1

ENB250 ELECTRICAL CIRCUITS
This unit introduces you to electrical circuit analysis. It shows how to determine the transient and steady state solution in single and three phase circuits as well as the interaction of fluxes and currents in transformers and electrical machines.
Prerequisites: ENB120  Antirequisites: ENB103  Credit points: 12  Contact hours: 4 per week  Campus: Gardens Point  Teaching period: 2011 SEM-1

ENB343 FIELDS, TRANSMISSION AND PROPAGATION
Fundamental concepts of static and time varying electromagnetic fields; Maxwell's equations and the characteristics of their solution, such as wave equations, losses in various media and energy flow; numerical methods; transmission line theory, terminated line, Smith Circle Chart usage and lattice diagram; propagation modes in waveguides and optical fibre; free-space propagation, reflection, refraction, diffraction; basic antenna theories and antenna parameters, Frii's transmission equation, half-wave dipole, two-element array.
Prerequisites: ENB103 or ENB250  Assumed knowledge: MAB127 or MAB182 or MAB132 is assumed knowledge.  Equivalents: EEBB341  Credit points: 12  Contact hours: 4 per week  Campus: Gardens Point  Teaching period: 2011 SEM-1

ENB344 INDUSTRIAL ELECTRONICS
The unit gives a basic understanding of linear and switching applications in industrial electronics. Practical knowledge associated with interfacing and design is developed. Students will also study the theory and design of advanced digital embedded systems as well as the practicalities associated with implementation. It also covers power rectification, controlled rectification, inverters, AC and DC drives, uninterruptible power supplies and power switching components.
Prerequisites: ENB240  Credit points: 12  Contact hours: 4 per week  Campus: Gardens Point  Teaching period: 2011 SEM-2

ENB346 DIGITAL COMMUNICATIONS
Revolutionary developments in the field of Digital Communication Technology have enabled improvement in the characteristics of communication systems in order to meet the performance requirements for transmission of information for private, business and industrial applications. This unit covers Elements of a Digital Communication System aims at providing the students with an in-depth understanding of the theory and applications of digital communication systems and technology.
Prerequisites: ENB342  Assumed knowledge: MAB233 is assumed knowledge.  Equivalents: EEBB346  Credit points: 12  Contact hours: 4 per week  Campus: Gardens Point  Teaching period: 2011 SEM-2

ENB347 MODERN FLIGHT CONTROL SYSTEMS
The modules of this unit are Control Systems B and Flight Control Systems. The unit provides students with an understanding of control system design and analysis for discrete time control systems as well as using the state space approach. Furthermore, it introduces students to different aspects of flight control including factors affecting
the performance and simulation. Specific topics such as artificial stability and MILSTDs are also covered.

**Prerequisites:** ENB348  
**Equivalents:** EEB535  
**Credit points:** 12  
**Contact hours:** 4 per week  
**Campus:** Gardens Point  
**Teaching period:** 2011 SEM-2

**ENB348 AIRCRAFT SYSTEMS AND FLIGHT CONTROL**

The modern aircraft is an extremely complex machine comprised of many systems. These systems include propulsion, engine management, flight management, flight control, navigation, and life support and flight data recorders. The safe and reliable operation of all these systems is required to conduct a single flight. The modern avionics engineer requires an understanding of all these systems and how they operate on modern civil and military aircraft. This unit places emphasis on the flight control systems of modern aircraft which is one of the primary sub-systems. As part of this, methods for modelling the dynamic behaviour of aircraft, missiles and spacecraft are introduced, along with the criteria for stability.

**Prerequisites:** MAB127 or MAB182 or MAB132  
**Assumed knowledge:** ENB121 and ENB140 are assumed knowledge.  
**Equivalents:** EEB431  
**Credit points:** 12  
**Contact hours:** 4 per week  
**Campus:** Gardens Point  
**Teaching period:** 2011 SEM-1

**ENB354 INTRODUCTION TO SYSTEMS DESIGN**

Introduction systems engineering methodologies and techniques as applied to Aerospace Engineering projects. The students receive formal lectures and apply the knowledge gained to a specific case study or mini project.

**Equivalents:** EEB385  
**Credit points:** 12  
**Contact hours:** 4 per week  
**Campus:** Gardens Point  
**Teaching period:** 2011 SEM-1

**ENB355 ADVANCED SYSTEMS DESIGN**

Students apply the systems engineering documentation and specifications developed in ENB345 Introduction to Systems Design and complete the project to the final systems engineering review stage.

**Prerequisites:** ENB354  
**Equivalents:** EEB685  
**Credit points:** 12  
**Contact hours:** 2 per week  
**Campus:** Gardens Point  
**Teaching period:** 2011 SEM-2

**ENB357 SPACECRAFT GUIDANCE AND CONTROL**

Assumed knowledge: MAB127 or MAB182 or MAB132 are assumed knowledge.  
**Credit points:** 12  
**Campus:** Gardens Point

**ENB440 RF TECHNIQUES AND MODERN APPLICATIONS**

This unit addresses the following: lumped and distributed microwave and RF circuits, including $\dot{y}$, $\mathbf{t}$ and $\mathbf{s}$ parameters; impedance matching techniques; passive and active microwave devices; RF circuit design techniques; microwave and RF measurement techniques; linear antennas and microwave antennas; analysis and synthesis of antenna arrays; specialised antennas and antenna measurements; EMC definition, standards and regulations; test plan; measurements; interference coupling; susceptibility; EMC design techniques, component selection, circuit layouts, grounding, shielding, filters, suppressors, isolation and safety; EMC management; propagation of electromagnetic fields in electrical materials; application of numerical methods.

**Prerequisites:** ENB343  
**Antirequisites:** ENB445  
**Assumed knowledge:** ENB242 and ENB244 are assumed knowledge.  
**Credit points:** 12  
**Contact hours:** 5 per week  
**Campus:** Gardens Point  
**Teaching period:** 2011 SEM-1

**ENB447 NAVIGATION SYSTEMS FOR AIRCRAFT**

Modern aviation continues to flourish, with millions of passenger miles flown each year throughout the world and in all kinds of weather condition. Safe and reliable navigation is one of the primary functions that enable these flights. In past years pilots navigated visually but this relied on fair weather conditions. Today pilots use navigation aids to allow navigation in all types of weather conditions day or night. This unit presents the principles and practices of modern navigation sensors and systems. To be a competent Avionics Engineer, a detailed knowledge of the principles of navigation is mandatory. Navigation is a fundamental building block for all aspects of aerospace projects.

**Prerequisites:** MAB127 or MAB182 or MAB132  
**Assumed knowledge:** ENB343 and ENB346 are assumed knowledge.  
**Equivalents:** EEB835  
**Credit points:** 12  
**Contact hours:** 4 per week  
**Campus:** Gardens Point  
**Teaching period:** 2011 SEM-2

**ENB448 SIGNAL PROCESSING AND FILTERING**

This unit gives a comprehensive introduction to the representation and processing of signals distorted or corrupted by noise, and the systems needed to process them. Techniques for estimating signal parameters for the detection of signals in the presence of noise will be discussed. The methods presented will be tested on real data drawn from different engineering applications, such as wireless communications, biomedical EEG signals and brain models, speech and music synthesis, and radars.

**Prerequisites:** ENB342  
**Assumed knowledge:** MAB233 is assumed knowledge.  
**Equivalents:** EEB941  
**Credit points:** 12  
**Contact hours:** 4 per week  
**Campus:** Gardens Point  
**Teaching period:** 2011 SEM-2

**ENB451 AEROSPACE RADIO AND RADAR SYSTEMS**

This unit includes a thorough treatment of the elements of radio and radar systems, ground, air and space based. This is a highly technical unit and an emphasis will be put on the
solution of technical problems and the knowledge required to solve these problems. Electromagnetic Compatibility and Electromagnetic Interference principles are covered in detail. Analysis of antennas, modulation techniques, amplifiers and filtering techniques for radio, as well as, types of radar and applications, Mechanisms for Ranging, Doppler Radar and Receiver Processing are some of topics addressed.

**Prerequisites:** ENB343  
**Equivalents:** EEB760  
**Credit points:** 12  
**Contact hours:** 3 per week  
**Campus:** Gardens Point  
**Teaching period:** 2011 SEM-1

**ENB457 CONTROLS, SYSTEMS AND APPLICATIONS**
Control systems are playing an increasingly important role in process control, energy management and utility management. This unit is concerned with the application of advanced control systems with an emphasis on physical architectures and implementations. Topics covered include control system actuators, sensors and controllers, control system architectures, human machine interfacing, adaptive control strategies and intelligent control.

**Prerequisites:** ENB301  
**Assumed knowledge:** This unit is limited to 30 enrolments  
**Credit points:** 12  
**Contact hours:** 4 per week  
**Campus:** Gardens Point  
**Teaching period:** 2011 SEM-2

**INB270 PROGRAMMING**  
This unit aims to give you a positive introduction to the skills required in solving computational problems and implementing solutions in a programming or scripting language. Although some theoretical aspects of computer programming are introduced briefly, the overall emphasis of the unit is programming practice. The unit emphasises generic programming concepts and related problem-solving strategies. The skills you learn in this unit will be applicable to a wide variety of commonly-used, industrially-significant programming and scripting languages.

**Prerequisites:** INB104 or ENB246  
**Antirequisites:** INN270  
**Equivalents:** ITB003  
**Credit points:** 12  
**Contact hours:** 3 per week  
**Campus:** Gardens Point  
**Teaching period:** 2011 SEM-1 and 2011 SEM-2

**MAB127 MATHEMATICS FOR ENGINEERING 2**
Building upon the foundations established in MAB125 or Senior Maths C, this unit addresses the significant role of mathematical modelling using vectors, matrices and multivariable calculus for the description and resolution of simple and complex problems relevant to the discipline of engineering. The formulation and solution of such problems is supported by appropriate advanced mathematical concepts used for function approximation, differentiation and integration. You will complete this unit in first year or first semester of second year depending on your initial maths background. Undertaking this unit will allow you to develop your problem solving skills, especially in the context of advanced mathematical techniques applied to vectors and matrices used to model engineering relevant problems.

**Assumed knowledge:** Grade of at least Sound Achievement in Senior Mathematics C (or equivalent) or MAB125 or MAB120 or MAB131 or MAB182 is assumed knowledge  
**Equivalents:** MAB112, MAB122, MAB132  
**Credit points:** 12  
**Contact hours:** 4 per week  
**Campus:** Gardens Point  
**Teaching period:** 2011 SEM-1, 2011 SEM-2 and 2011 SUM