Bachelor of Technology Innovation (Physics) (ST50)

Year offered: 2011
Admissions: Yes
CRICOS code: 070694G
Course duration (full-time): 4 years
Domestic Fees (indicative): 2011: CSP $2,178 (indicative) per semester
International Fees (indicative): 2011: $12,250 (indicative) per semester
Domestic Entry: February
International Entry: February and July
QTAC code: 418311
Past rank cut-off: 76
Past OP cut-off: 12
OP Guarantee: Yes
Assumed knowledge: English (4,SA), Maths B (4,SA), Chemistry (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: 96
Course coordinator: Associate Professor Chris Collet
Campus: Gardens Point

Why Choose This Course
If you like to work in a dynamic world of translating discovery and creativity into commercial products, meeting people, and working in a high-powered team environment to build money-making enterprises, then this course is for you. The Bachelor of Technology Innovation will allow a rapid entry into the high-flying world of commercialisation and technology transfer. This new degree builds upon the successful Bachelor of Biotechnology Innovation which has seen graduates realise outstanding job outcomes, often successfully competing against graduates with PhDs and MBAs.

Professional Recognition
Graduates are eligible for membership of the Australian Institute of Physics (AIP).

Your Course
Year 1
You will be able to choose subjects from across a range of science and technology areas to help you define your choice of disciplinary major. The introductory core studies will provide you with a solid foundation in your chosen disciplinary skills and build the basis for future studies.

Year 2
You will be introduced to advanced theoretical concepts and practical skills that serve to build your expertise in the science and technology disciplines. A thorough understanding of science and technology theory and practice is necessary to understand, evaluate and communicate aspects of innovation to the business world.

Year 3
In third year, you will complete your science and technology disciplinary advanced studies and take basic and advanced business units that encompass the business of innovation, intellectual property law and professional skills development. Through the action learning framework of the Student Enterprise Scheme, professional skills development will concentrate on communication and team-building skills. These exercises will help prepare you for industry-based consultancy style projects and extra-curricular networking events and an industry career.

Year 4
You will undertake integrative business units that develop the entrepreneurial mindset needed for a career in innovation commercialisation. You will further develop your professional skills through networking events. Student teams will source an industry-based consultancy-style project that will serve to provide real world experience and ready you for your future career.

Physics Major Course Structure

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<tr>
<th>Year 1 Semester 1</th>
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<tr>
<td>SCB110</td>
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<td>SCB111</td>
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NOTE: Students with a Sound Achievement in Maths B and NOT wishing to major in Mathematics or Physics should enrol in MAB101
Students without a Sound Achievement (4 semesters) in Maths B should enrol in MAB105
Students with a Sound Achievement in Maths C and wishing to major in Mathematics or Physics should enrol in MAB121
Students without a Sound Achievement in Maths C and wishing to major in Mathematics or Physics should enrol in MAB120
### Year 1 Semester 2
- **MAB122** Algebra and Analytic Geometry
- **PQB250** Mechanics and Electromagnetism
- **PQB251** Waves and Optics
  
### Year 2 Semester 1
- **MAB311** Advanced Calculus
- **PQB350** Thermodynamics of Solids and Gases
  
### Year 2 Semester 2
- **PQB450** Energy, Fields and Radiation
- **PQB451** Electronics and Instrumentation
  
### Year 3 Semester 1
- **BSB115** Management
- **PQB550** Quantum and Condensed Matter Physics
- **PQB551** Physical Analytical Techniques
- **STB551** Engaging with the Innovation Industry
  
### Year 3 Semester 2
- **BSB126** Marketing
- **MGB223** Entrepreneurship and Innovation
- **PQB650** Advanced Theoretical Physics
- **PQB651** Experimental Physics
  
### Year 4 Semester 1
- **AMB240** Marketing Planning and Management
- **LWS007** Introduction To Intellectual Property Law
- **MGB324** Managing Business Growth
- **STB709-1** Innovation and Commercialisation Project
  
### Year 4 Semester 2
- **BSB311** Innovation Commercialisation Strategies
- **MGB225** Intercultural Communication and Negotiation Skills
- **STB709-2** Innovation and Commercialisation Project
- **STB709-3** Innovation and Commercialisation Project

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### UNIT SYNOPSES

#### AMB240 Marketing Planning and Management
This unit extends the student’s knowledge of the fundamental marketing concepts and theories introduced in the Faculty Core unit in Marketing, by adding further breadth and depth of knowledge of marketing and developing skills in the application of this knowledge to marketing planning and management within the business environment. Emphasis is on the role of the marketing manager at the product management level in undertaking analysis, planning, implementation and control of marketing activities.

**Prerequisites:** BSB126 or CTB126  
**Equivalents:** AMX240, CTB240  
**Credit points:** 12  
**Contact hours:** 3 per week  
**Campus:** Gardens Point and Caboolture  
**Teaching period:** 2011 SEM-1 and 2011 SEM-2

#### BSB115 Management
The unit provides an introduction to the theories and practice of management and organisations. Emphasis is on the conceptual and people skills that are needed in all areas of management and in all areas of organisational life. The unit acknowledges that organisations exist in an increasingly international environment where the emphasis will be on knowledge, the ability to learn, to change and to innovate. Organisations are viewed from individual, group, corporate and external environmental perspectives.

**Antirequisites:** BSD115  
**Equivalents:** BSX115, CTB115  
**Credit points:** 12  
**Contact hours:** 3 per week  
**Campus:** Gardens Point and Caboolture  
**Teaching period:** 2011 SEM-1, 2011 SEM-2 and 2011 SUM-1

#### BSB126 Marketing
This introductory subject examines the role and importance of marketing to the contemporary organisation. Emphasis is placed on understanding the basic principles and practices of marketing such as the marketing concept, market segmentation, management information systems and consumer behaviour. The unit explores the various
elements of the marketing mix, with special reference to product, price, distribution, and promotion, including advertising and public relations. By way of introduction only, key issues relating to services marketing, e-marketing and strategic marketing are also canvassed.

**Assumed knowledge:** BSB116, BSD126
**Equivalents:** BSX126, CTB126

**Credit points:** 12
**Contact hours:** 4 per week
**Campus:** Gardens Point and Caboolture
**Teaching period:** 2011 SEM-1, 2011 SEM-2 and 2011 SUM

**MAB311 INNOVATION COMMERCIALISATION STRATEGIES**
Students study strategies and approaches used in industry and government organisations for the research, development and commercialisation of biotechnology innovations. The unit offers the opportunity to read widely as well as in depth about the commercialisation of molecular biology and biotechnology research. Theoretical concepts are integrated with prepared case studies prior to guest speaker seminars.

**Prerequisites:** MGB223 or LSP127
**Credit points:** 12
**Contact hours:** 3 per week
**Campus:** Gardens Point
**Teaching period:** 2011 SUM-2

**LWS007 INTRODUCTION TO INTELLECTUAL PROPERTY LAW**
Intellectual property protection is undoubtedly of paramount importance in the research, development and commercialisation of emerging technologies. Managers and researchers need to be aware of the different types of property that can be protected and how the property needs to be protected. There have also been significant developments in the field of intellectual property law in recent years. The concepts taught in Introduction to Intellectual Property Law are of significant relevance to persons intending to practice in the emerging fields of science.

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

**MAB105 PREPARATORY MATHEMATICS**
This unit is intended to cater for the needs of students whose background in mathematics is either weak or does not reach the equivalent of Senior Mathematics B. It is intended to provide the concepts and skills needed for successful study of those units within the university which assume a background equivalent to Senior Mathematics B. This unit is incompatible with a grade of High Achievement in Senior Mathematics B. The aim of this unit is to develop your mathematical skills in and understanding of algebra, functions and graphing, differential and integral calculus of one variable and to interpret and solve simple, real world problems using these skills.

**Assumed knowledge:** Year 10 Level 6 Mathematics is assumed knowledge
**Credit points:** 12
**Contact hours:** 4 per week
**Campus:** Gardens Point
**Teaching period:** 2011 SEM-1 and 2011 SEM-2

**MAB120 ALGEBRA AND CALCULUS**
This unit introduces and reviews the elementary concepts of function, calculus, matrices and vectors with special reference to applications in science, technology and business where appropriate. Topics covered include the algebra of complex numbers, elementary functions (polynomial, trigonometric, exponential and logarithmic) and their properties, differentiation and integration methods and principles, geometric and algebraic applications of vectors and the solution of linear systems using matrices.

**Assumed knowledge:** MAN120
**Credit points:** 12
**Contact hours:** 4 per week
**Campus:** Gardens Point
**Teaching period:** 2011 SEM-1, 2011 SEM-2 and 2011 SUM

**MGB223 or LSP127**

**BSB116, BSD126**

**CTB126**

**BSX126, MAB105**

**MAB100, MAB125, MAB180**

**MAB120**

**MAN120**

**MGB223 or LSP127**

**BSB116, BSD126**

**CTB126**
Antirequisites: MAN121  Assumed knowledge: Grade of at least Sound Achievement in Senior Mathematics C (or equivalent) or MAB120 or MAB100 or MAB125

Equivalents: MAB111, MAB126, MAB131, MAB182
Credit points: 12  Contact hours: 4 per week  Campus: Gardens Point  Teaching period: 2011 SEM-1, 2011 SEM-2 and 2011 SUM

MAB122 ALGEBRA AND ANALYTIC GEOMETRY
Building upon the foundations established in MAB120 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 in the real world. The formulation and solution of such problems is supported by appropriate advanced mathematical concepts used for function approximation, differentiation and integration. Undertaking this unit will allow you to develop your problem solving skills, especially in the context of advanced mathematical techniques applied to vectors, matrices and multivariable functions used to model real world problems.

Assumed knowledge: Grade of at least Sound Achievement in Senior Mathematics C (or equivalent) or MAB120 or MAB100 or MAB125  
Equivalents: MAB112, MAB127, MAB132  Credit points: 12  Contact hours: 4 per week  Campus: Gardens Point  Teaching period: 2011 SEM-1, 2011 SEM-2 and 2011 SUM

MAB220 COMPUTATIONAL MATHEMATICS 1
Many real world problems are not solvable analytically, meaning that it is necessary to develop computational methods that can be used to solve these problems. Additionally, to be able to apply these methods to large problems, they must be implemented as algorithms in a computer language such as MATLAB. This unit addresses both the theoretical development of computational methods and their implementation in MATLAB. The aim of this unit is to provide you with the introductory concepts, computational techniques and programming skills that will allow you to solve many real world problems. It is also designed to prepare you for study in the advanced units in computational mathematics.

Antirequisites: MAN220  Assumed knowledge: Grade of at least Sound Achievement in Senior Mathematics B (or equivalent) or MAB105 and corequisite MAB120 or MAB125 or MAB100 or MAB180 if you don't have Senior Mathematics C is assumed knowledge  Credit points: 12  Contact hours: 4 per week  Campus: Gardens Point  Teaching period: 2011 SEM-1 and 2011 SEM-2

MAB311 ADVANCED CALCULUS
This unit includes the following: polar coordinates; parametric equations; conic sections; quadric surfaces; vector-valued functions; Fourier series; functions of several variables; graphs; partial derivatives; total derivatives; extrema; Lagrange multipliers; Taylor series for multivariable functions; double and triple integrals; Green's theorems; line and surface integrals; divergence theorem; Stoke's theorem; applications.

Prerequisites: (MAB111 or MAN121) and (MAB112 or MAB122)
Credit points: 12  Contact hours: 4 per week  Campus: Gardens Point  Teaching period: 2011 SEM-1

MGB223 ENTREPRENEURSHIP AND INNOVATION
This unit introduces students to the nature and characteristics of entrepreneurship and innovation and explores the inter-relationship between the two within contemporary economies from managerial perspective. Learning will be directed towards developing the theoretical and applied knowledge, skills, and attitudes that will support and enhance innovation and enterprise creation activity, through the development of a business plan. The unit is designed for those individuals interested in creating a new venture or working in industries as employees of venture owners or those that serve this sector. Students will have opportunity to build a comprehensive plan of their business concept.

Prerequisites: BS1115 or CTB115  Equivalents: CTB223, MGX223  Credit points: 12  Contact hours: 3 per week  Campus: Gardens Point and Caboolture  Teaching period: 2011 SEM-1 and 2011 SEM-2

MGB225 INTERCULTURAL COMMUNICATION AND NEGOTIATION SKILLS
The course develops students' abilities to identify and resolve problems in cross-cultural communication or negotiation situations where cultural differences have created misunderstandings or undesirable or unexpected outcomes. It first explores the concept of ‘national culture’ by considering the work of major theorists of cultural value dimensions - from Hall to Schwartz. Students are encouraged to analyse communication/negotiation process issues in terms of these value dimensions and to practise managing the process of communication/negotiation to improve their outcomes.

Prerequisites: BS1115, CTB115, BS1119 or BS1214  Equivalents: IBB205, MGX225  Credit points: 12  Contact hours: 3  Campus: Gardens Point and Caboolture  Teaching period: 2011 SEM-1 and 2011 SEM-2

MGB324 MANAGING BUSINESS GROWTH
This unit is designed to provide skills in the analysis, solutions and implementation of the general management issues that SME owners have to manage in their growing operations. The unit brings together the different functional aspects of managing an established SME and how they are best managed from the owner's (general manager's) point of view. It also provides opportunity to bring students into contact with real world SME owners and their venture
management issues.

**Prerequisites:** MGB223  
**Equivalents:** MGB218, MGX324  
**Credit points:** 12  
**Contact hours:** 3  
**Campus:** Gardens Point and Caboolture  
**Teaching period:** 2011 SEM-1

**PCB593 DIGITAL IMAGE PROCESSING**

This unit provides students with a basic understanding of the computer techniques used in image processing and reconstruction. Specific areas of study include the following: the structure of a digital image; image display techniques; grey scale palettes and look-up tables; Fourier transform theory; convolution theory; image processing hardware; image processing techniques, eg analysis, enhancement and restoration; spatial filtering; Fourier space filtering; methods of image reconstruction; 3D volume and surface rendering; applications of image processing in medicine, astronomy and remote sensing, etc.

**Prerequisites:** PCB375-2 or PCB496 or PQB250  
**Credit points:** 12  
**Contact hours:** 4 per week  
**Campus:** Gardens Point  
**Teaching period:** 2011 SEM-1

**PQB250 MECHANICS AND ELECTROMAGNETISM**

The experimental means by which we have arrived at our modern understanding of the universe is central to the scientific philosophy. Students of physics and physics related areas need to possess skills in quantitative handling, processing, communication and evaluation of data. Higher level studies in specialised areas of Physics require a familiarity with a range of fundamental topics in Physics and an ability to apply critical thinking and advanced mathematical techniques to the analysis and solution of Physical problems. This first-level unit lays the foundation for these higher level studies by introducing the fundamental topic areas of mechanics and electromagnetism.

**Assumed knowledge:** Senior Maths B is assumed knowledge.  
**Credit points:** 12  
**Contact hours:** 4.5  
**hours per week**  
**Campus:** Gardens Point  
**Teaching period:** 2011 SEM-1

**PQB251 WAVES AND OPTICS**

Wave phenomena are used to describe and explain many of the physical processes in the universe. Sound and light are the most commonly experienced of these and have far-reaching human applications, including their use as experimental tools for science. The study of wave phenomena has led to the development of quantum mechanics, a cornerstone of modern scientific thought. This first-level unit lays the foundation for discussion of wave phenomena in higher level studies, but will also be relevant to those not considering progressing to a Physics major but wishing to understand more of the Physical world in which we live.

**Assumed knowledge:** Senior Maths B is assumed knowledge.  
**Credit points:** 12  
**Contact hours:** 4.5  
**hours per week**  
**Campus:** Gardens Point  
**Teaching period:** 2011 SEM-2

**PQB350 THERMODYNAMICS OF SOLIDS AND GASES**

This unit provides students with an overview of the basic thermodynamic principles that describe how heat and other forms of energy are transported through matter in its solid and gaseous states. Through integrated lecture and practical classes, it provides students with a foundation for more advanced studies later in areas such as condensed matter physics and quantum mechanics. The three areas of study in this unit; thermodynamics, solid state physics and statistical physics; are essential core topics if students are considering postgraduate study in the physical sciences or professional employment as a physicist.

**Prerequisites:** (PQB250 or PCB250), and (MAB111 or MAB120 or MAB121)  
**Corequisites:** MAB311  
**Assumed knowledge:** Students should enrol in MAB311 in the same semester if not already completed  
**Equivalents:** PCB562  
**Credit points:** 12  
**Contact hours:** 4 per week  
**Campus:** Gardens Point  
**Teaching period:** 2011 SEM-1

**PQB360 GLOBAL ENERGY BALANCE AND CLIMATE CHANGE**

Modern societies are becoming increasingly aware of potential environmental problems associated with conventional energy production technologies. Application of alternative technologies is therefore increasing, with ambitious targets and plans to support research and development for reducing energy related environmental consequences. This unit is designed to offer science and engineering students an opportunity to gain awareness about the expanding field of alternative energy technologies and to understand relationships between use of energy and its impact on local and global environment.

**Prerequisites:** MAB121 and MAB122  
**Equivalents:** PCB563  
**Credit points:** 12  
**Contact hours:** 4 per week  
**Campus:** Gardens Point  
**Teaching period:** 2011 SEM-1

**PQB450 ENERGY, FIELDS AND RADIATION**

The common theme of the topics covered in this unit is fields, the energy contained in these fields and the transfer of this energy. This theme is addressed in the specific topics of classical mechanics, electromagnetism and radiation physics. The classical mechanics and electromagnetism components build on material presented in introductory units and apply this to complex real world problems. The unit is designed to prepare students for more advanced studies in these areas but the unit will also provide a useful background for students undertaking a comajor in Physics or preparing for a career in secondary education.

**Prerequisites:** PQB250 or PCB250, and MAB311  
**Equivalents:** PCB382  
**Credit points:** 12  
**Contact hours:** 4 per week  
**Campus:** Gardens Point  
**Teaching period:** 2011 SEM-2
PQB451 ELECTRONICS AND INSTRUMENTATION

Instrumentation plays an increasingly important role in the life of a scientist. This unit is designed to give the student a working knowledge in instrumentations and the principles of circuit theory and electronics that underlie instrumentation. It is offered at this stage of the program since it relies on work developed in the earlier advanced-level units and provides a basis for experimental work in later units.

Prerequisites: PQB250 or PCB250  
Antirequisites: PCB361, PCB460  
Credit points: 12  
Contact hours: 4 per week  
Campus: Gardens Point  
Teaching period: 2011 SEM-2

PQB460 ASTROPHYSICS 1

This second level unit is one of the key units in the astrophysics co-major and introduces students to most of the main aspects of astrophysics. This unit is essential as it defines the connections between the supporting units of the co-major. Students are required to use the knowledge and skills developed in first level physics, maths and natural resource units.

Prerequisites: PQB250 or PCB250 or PCB150  
Equivalents: PCB469  
Credit points: 12  
Contact hours: 4 per week  
Campus: Gardens Point  
Teaching period: 2011 SEM-2

PQB550 QUANTUM AND CONDENSED MATTER PHYSICS

TBA

Prerequisites: PQB350 and (MAB134 or MAB311)  
Equivalents: PCB561  
Credit points: 12  
Contact hours: 4 per week  
Campus: Gardens Point  
Teaching period: 2011 SEM-1

PQB551 PHYSICAL ANALYTICAL TECHNIQUES

Modern methods of physical analysis are an important tool for the physical scientist. This unit provides an introduction to the physical principles and applications in three fields of analysis: X-ray diffraction, analytical electron microscopy and physical spectroscopy. Each of these topics encompasses a variety of measurement techniques. The methodologies presented have wide application in a number of areas of science and technology including nanotechnology and materials research and development. Lectures are supplemented by laboratory practicals to enable students to gain familiarity and experience with the instrumentation.

Prerequisites: (PQB350 or PCB462) and (MAB112 or MAB122)  
Equivalents: PCB562  
Credit points: 12  
Contact hours: 4 per week  
Campus: Gardens Point  
Teaching period: 2011 SEM-1

PQB650 ADVANCED THEORETICAL PHYSICS

Advanced electromagnetism, magnetism of materials and magnetic resonance, and advanced statistical mechanics are the fundamental topics for any advanced-level Physics degree. They provide fundamental background knowledge and problem solving skills that are essential in any area of modern theoretical, experimental, and applied physics. This unit also provides you with an essential platform for further studies and research in physics and applied physics in Honours and at the post-graduate level. The aim of this unit is to provide you with an advanced understanding of fundamental physical phenomena related to electromagnetism and wave propagation, quantum and statistical basis of nuclear magnetism and magnetic resonance, statistical mechanics, quantum statistics, and general statistical thermodynamics.

Prerequisites: (PQB350 or PCB462) and (PQB550 or PCB561)  
Equivalents: PCB665  
Credit points: 12  
Contact hours: 4 per week  
Campus: Gardens Point  
Teaching period: 2011 SEM-2

SCB110 SCIENCE CONCEPTS AND GLOBAL SYSTEMS

You will undertake interdisciplinary study of the physical, geological and biological concepts relating to the origins of life; from the creation of matter and planets, to the emergence of life in all its complexity, culminating in evolution of earth ecosystems. Human influences, overlaid upon earth’s complex systems, will be examined as to their type, extent, and impact. In counterpart, you will explore the breadth of philosophical developments underlying our search for knowledge; fundamental thoughts and ideas that span the last 2,500 years of human history. Ultimately, these concepts evolved through the development of a scientific method and we explore its workings in relation to the ongoing enterprise of human understanding.

Credit points: 12  
Contact hours: 4.5 per week  
Campus: Gardens Point  
Teaching period: 2011 SEM-1

SCB111 CHEMISTRY 1

Chemistry is the central science. It affects society as well as the individual. It is the language and principal tool of the physical sciences, the biological sciences, the health
University study with the professional practice of innovation commercialisation context. New venture areas of industry, focussed as they often are on emergent technologies and the commercialisation of innovation, require graduates capable of high levels of critical thinking and evaluation coupled with a sound technical and business knowledge and skills base of relevance to the particular innovation context. The capacity to conduct rigorous analysis into the research, development and commercialisation of products and processes is a fundamental aspect of converting real-world science and technology into products for the global marketplace.

Prerequisites: STB551  Credit points: 12  Teaching period: 2011 SEM-1, 2011 SEM-2 and 2011 SUM

STB709 INNOVATION AND COMMERCIALISATION PROJECT

The Innovation and Commercialisation Project is a capstone unit that provides a concrete opportunity for students to consolidate and contextualise the knowledge and skills they have acquired in the course and apply them to a substantial project. The unit serves to provide work experience and link University study with the professional practice of innovation commercialisation context. New venture areas of industry, focussed as they often are on emergent technologies and the commercialisation of innovation, require graduates capable of high levels of critical thinking and evaluation coupled with a sound technical and business knowledge and skills base of relevance to the particular innovation context. The capacity to conduct rigorous analysis into the research, development and commercialisation of products and processes is a fundamental aspect of converting real-world science and technology into products for the global marketplace.

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