Master of Biotechnology (Advanced) (LS96)

Year offered: 2011
Admissions: Yes
CRICOS code: 054279M
Course duration (full-time): 4 semesters (2 years)
Course duration (part-time): 8 semesters (4 years)
Domestic Fees (indicative): 2011: Full fee tuition $8,250 (indicative) per semester
International Fees (indicative): 2011: $11,875 (indicative) per semester
Domestic Entry: July (Note: Students commencing in July, enrol in Semester 2 units first) *Also see "ENTRY REQUIREMENTS" below
International Entry: July (Note: Students commencing in July, enrol in Semester 2 units first) *Also see "ENTRY REQUIREMENTS" below
Total credit points: 192
Standard credit points per full-time semester: 48
Standard credit points per part-time semester: 24
Course coordinator: Dr Mark O'Brien
Campus: Gardens Point

Overview
The Master of Biotechnology (Advanced) program completes the comprehensive training of students and follows successful completion of core and optional units offered in the Graduate Certificate in Biotechnology, Graduate Diploma in Biotechnology and Master of Biotechnology programs. It encompasses general medical and/or plant biotechnology. In their final semester of the program, students may undertake a supervised research project either at QUT or external to QUT.

Part-time students may also elect to do a research project at their place of work, with both a workplace supervisor and a QUT supervisor. Students must discuss research project areas prior to enrolment in their final semester of study in LS96 to organise a suitable project and a project supervisor(s). While there is a wide range of research project areas available, it may not always be possible for students to conduct a research project exactly in the area they desire.

There is also no guarantee that either a suitable project and/or project supervisor(s) will be available in the semester that the student wishes to undertake the project unit.

Some students prefer not to undertake a research project in their final semester of study. For students not undertaking a research project, additional coursework must be completed. Students will need to consult with the course coordinator in selecting additional coursework units.

These postgraduate coursework programs will suit anyone who has a recent undergraduate degree (preferably, however not necessarily, in science) and who wishes to gain training and advanced specialisation in general, medical and/or plant biotechnology. The programs also cater for working scientists, support staff or students involved in commercial aspects of biotechnology who wish to update their theoretical and practical biotechnology skills.

Science-based biotechnology units emphasising laboratory skills and hands-on laboratory experimentation feature prominently in the programs, which cover contemporary techniques in biotechnology. New technology is incorporated as it becomes available. The programs also offer students opportunities to pursue studies related to the business of biotechnology, marketing and commercialisation, as well as the legal and ethical aspects of biotechnological applications.

Course Design
The program of study for an individual student will be decided in consultation with the course coordinator and will take into account the student's background in the cell and biomolecular sciences and areas of interest in biotechnology.

The Graduate Certificate in Biotechnology is a foundation program for people without a science degree or for those who do not have a recent background in the cell and biomolecular sciences. Fundamental aspects of cell and molecular biology, biochemistry and microbiology are covered in this first program. Successful completion of this program allows students to then specialise in more advanced aspects of biotechnology. The Graduate Certificate in Biotechnology also allows students to gain essential generic skills and attributes for successful postgraduate research and learning.

Students must commence in July and enrol in Semester 2 units first. Advanced standing (credit) may be given for this foundation program if the student has a degree or equivalent with recent and appropriate undergraduate-level knowledge and practical experience in the key areas of molecular biology, cell biology, biochemistry and/or microbiology at an advanced level. If advanced standing (credit) is granted and accepted, students can enrol directly in any of the more advanced biotechnology programs in their first semester of study.

The Graduate Diploma in Biotechnology builds upon foundation concepts presented in the Graduate Certificate. The Graduate Diploma in Biotechnology offers students opportunities to pursue study in several relevant focus areas including the theoretical and practical aspects of biotechnology. It also covers the business of biotechnology, marketing and commercialisation, as well as the legal and ethical aspects of biotechnological applications.

The Master of Biotechnology is designed to give students...
further training and specialisation in general medical and/or plant biotechnology. This program follows successful completion of core and optional units offered in both the Graduate Certificate in Biotechnology and Graduate Diploma in Biotechnology.

Further Information
For further information about this course, please contact:

Dr Mark O’Brien
Phone: +61 7 3138 2782
Email: enquiry.scitech@qut.edu.au

Course structure - Full-time

<table>
<thead>
<tr>
<th>Year 1, Semester 2 (MODULE 1)</th>
<th>LSN101 Molecular Biosciences</th>
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<tbody>
<tr>
<td></td>
<td>LSN102 Cellular Biosciences</td>
</tr>
<tr>
<td></td>
<td>LSN103 Postgraduate Learning and Research Skills</td>
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<td></td>
<td>LSN483 Molecular Biology Techniques</td>
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Year 2, Semester 1 (MODULE 2)

<table>
<thead>
<tr>
<th>LSP127 Business Aspects of Biotechnology</th>
<th>Either</th>
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<tbody>
<tr>
<td>LSN583 Genetic Research Technology</td>
<td></td>
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<tr>
<td>LSN585 Plant Genetic Manipulation</td>
<td>In consultation with the course coordinator, choose 24 credit points from the following units:</td>
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| LQB582 Biomedical Research Technologies | |
| LSN583 Genetic Research Technology | |
| LSN584 Medical Cell Biology | |
| LSN585 Plant Genetic Manipulation | |
| LWN135 Law, Justice and New Genetic Technologies | |
| AMN442 Marketing Management | |

Year 2, Semester 2 (MODULE 3)

<table>
<thead>
<tr>
<th>BSB311 Innovation Commercialisation Strategies</th>
<th>Either</th>
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<tbody>
<tr>
<td>LQB685 Plant Microbe Interactions</td>
<td></td>
</tr>
<tr>
<td>LSN684 Medical Biotechnology 2</td>
<td>In consultation with the course coordinator, choose 24 credit points from the following units:</td>
</tr>
</tbody>
</table>

| LQB484 Introduction to Genomics and Bioinformatics | |

Year 3, Semester 1 (MODULE 4)

| LSN710 Project | For those students NOT undertaking LSN710 Project, in consultation with the course coordinator, choose 48 credit points from the following units: |

| LQB582 Biomedical Research Technologies | |
| LSN583 Genetic Research Technology | |
| LSN584 Medical Cell Biology | |
| LSN585 Plant Genetic Manipulation | |
| LWN135 Law, Justice and New Genetic Technologies | |

Course structure - Part-time

<table>
<thead>
<tr>
<th>Year 1, Semester 2 (MODULE 1)</th>
<th>LSN101 Molecular Biosciences</th>
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<tbody>
<tr>
<td></td>
<td>LSN102 Cellular Biosciences</td>
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</table>

Year 2, Semester 2 (MODULE 1)

| LSN103 Postgraduate Learning and Research Skills | |
| LSN483 Molecular Biology Techniques | |

Year 3, Semester 1 (MODULE 2)

<table>
<thead>
<tr>
<th>LSN583 Genetic Research Technology</th>
<th>Either</th>
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</thead>
<tbody>
<tr>
<td>LSN585 Plant Genetic Manipulation</td>
<td></td>
</tr>
<tr>
<td>LSP127 Business Aspects of Biotechnology</td>
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Year 3, Semester 2 (MODULE 3)

In consultation with the course coordinator, choose 24 credit points from the following units:

| LQB681 Biochemical Research Skills | |
| LQB682 Protein Biochemistry and Bioengineering | |
| LSN103 Postgraduate Learning and Research Skills | |
| MGN409 Introduction to Management | |

Year 4, Semester 1 (MODULE 2)

In consultation with the course coordinator,
choose 24 credit points from the following units:

- **LQB582** Biomedical Research Technologies
- **LSN583** Genetic Research Technology
- **LSN584** Medical Cell Biology
- **LSN585** Plant Genetic Manipulation
- **LWN135** Law, Justice and New Genetic Technologies
- **AMN442** Marketing Management

### Year 4, Semester 2 (MODULE 3)

- **BSB311** Innovation Commercialisation Strategies
  - Either
  - **LQB685** Plant Microbe Interactions
  - Or
  - **LSN684** Medical Biotechnology 2

### Year 5, Semester 1 (MODULE 4)

- **LSN711** Project 1
  - For those students NOT undertaking LSN712 Project 2, in consultation with the course coordinator, choose 48 credit points from the following units:
    - **LQB582** Biomedical Research Technologies
    - **LSN583** Genetic Research Technology
    - **LSN584** Medical Cell Biology
    - **LSN585** Plant Genetic Manipulation
    - **LWN135** Law, Justice and New Genetic Technologies

### Year 5, Semester 2 (MODULE 4)

- **LSN712** Project 2
  - For those students NOT undertaking LSN711 Project 1, in consultation with the course coordinator, choose 24 credit points from the following units:
    - **LQB484** Introduction to Genomics and Bioinformatics
    - **LQB681** Biochemical Research Skills
    - **LQB682** Protein Biochemistry and Bioengineering
    - **LQB685** Plant Microbe Interactions
    - **LSN684** Medical Biotechnology 2
    - **MGN409** Introduction to Management

### Potential Careers:

- Biochemist
- Biotechnologist
- Medical Biotechnologist
- Microbiologist
- Molecular Biologist
- Plant Biotechnologist
- Research Assistant
- Scientist
- Virologist

### UNIT SYNOPSES

#### AMN442 MARKETING MANAGEMENT

The study of marketing, marketing systems and marketing management and marketing planning within contemporary structure of social, cultural, political, economic, business and organisational environment. Concepts are applied through the study and construction of a marketing plan, which involves market and sales analysis, target market strategies, tactical decision planning, and implementation and control. Marketing management concepts are applied to virtual and physical markets and attention is given to a range of skills in finance, human resources, information and other skills needed by marketing managers in these markets.

**Antirequisites:** MIN422  
**Equivalents:** AMX442  
**Credit points:** 12  
**Contact hours:** 3 per week  
**Campus:** Gardens Point and External  
**Teaching period:** 2011 SEM-1 and 2011 SEM-2

#### BSB311 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 SEM-2

#### LQB484 INTRODUCTION TO GENOMICS AND BIOINFORMATICS

The completion of the Human Genome project, along with similar projects on other organisms of a prokaryote and eukaryote nature, marked the beginning of a major revolution in fundamental biology that changed our understanding of the natural world. To understand how information on genome structure-function relationships (ie bioinformatics) is being used in areas such as gene discovery, disease diagnosis and drug development, students need to understand how the information content of DNA and proteins is extracted and analysed. This unit introduces students to the approaches to database mining and genome exploration.

**Prerequisites:** LQB383 or LSB338 or LSN101 and LSN102  
**Antirequisites:** LSB537, LSB619, LSB469  
**Credit points:** 12  
**Contact hours:** 4 per week  
**Campus:** Gardens Point  
**Teaching period:** 2011 SEM-2
LQB582 BIOMEDICAL RESEARCH TECHNOLOGIES
This unit will study the technical principles and practical techniques that are essential for advancing research and development in biochemistry and biotechnology.

**Prerequisites:** LQB381 or LSB308  
**Antirequisites:** LSB527  
**Credit points:** 12  
**Contact hours:** 4 per week  
**Campus:** Gardens Point  
**Teaching period:** 2011 SEM-2

LQB681 BIOCHEMICAL RESEARCH SKILLS
In the real world, the design and completion of successful research and/or business projects demand that individuals gather information, solve problems, work effectively as a part of a team and analyse and communicate results in a critical manner. This unit offers opportunities for you to develop these skills that are valued highly by potential employers and research project leaders. The aim of this unit is to assist you to demonstrate and strengthen a number of generic research skills in a mentored problem-based learning environment that mirrors a real-world research team and the challenges that they face.

**Prerequisites:** LQB381 or LSB308. Students with equivalent study can apply for a requisite waiver  
**Equivalents:** LSB607  
**Credit points:** 12  
**Contact hours:** 5 per week  
**Campus:** Gardens Point  
**Teaching period:** 2011 SEM-2

LQB682 PROTEIN BIOCHEMISTRY AND BIOENGINEERING
This unit is designed to give you the essential concepts and techniques driving research and industrial biotechnology so that you will be equipped for multiple careers in the biological sciences. The skills you develop will allow you to enter a practical laboratory environment or to apply your knowledge in related areas of evaluations of technologies and intellectual property.

**Prerequisites:** LQB381 or LSB308 or LSB325 or (LSN101 and LSN102)  
**Antirequisites:** LSB605, LSB608  
**Credit points:** 12  
**Contact hours:** 5 per week  
**Campus:** Gardens Point  
**Teaching period:** 2011 SEM-2

LQB685 PLANT MICROBE INTERACTIONS
Microorganisms, including viruses, bacteria and fungi, cause many devastating diseases in plants and are responsible for significant losses to crops in Australia and Internationally. Diagnosis and control of these organisms, which vary considerably in their biology and infection strategies, is an ongoing challenge. However, plant genetic engineering approaches are now offering new and novel solutions to these problems. These approaches are of widespread scientific, commercial and humanitarian interest. The application of current technologies and development of new, novel technologies relies on an understanding of the biology of the organism, of the way in which these organisms cause disease in plants and the mechanism by which many plants are resistant.

**Prerequisites:** LQB483 or LSN483  
**Antirequisites:** LSB578  
**Assumed knowledge:** LQB386 recommended  
**Credit points:** 12  
**Contact hours:** 4 per week  
**Campus:** Gardens Point  
**Teaching period:** 2011 SEM-2

LSN101 MOLECULAR BIOSCIENCES
For you to be successful in the more advanced units offered in the coursework programs in biotechnology you must have a sound knowledge and understanding in the key areas of molecular biology, cell biology, biochemistry and microbiology and be able to demonstrate your learning in a practical way in the laboratory. This unit, in conjunction with LSN102 Cellular Biosciences and LQB483 Molecular Biology Techniques, will help you to achieve those goals. This unit aims to facilitate your active learning (knowledge, understanding and application) of cell and molecular biology appropriate for a postgraduate degree in biotechnology.

**Corequisites:** LSN102, LSN483  
**Assumed knowledge:** Students should enrol in either LSN102 or LSN483 in the same semester if not already completed  
**Credit points:** 12  
**Contact hours:** 5 per week  
**Campus:** Gardens Point  
**Teaching period:** 2011 SEM-2

LSN102 CELLULAR BIOSCIENCES
Central to your understanding of the fundamental theory underlying medical and plant biotechnology is an understanding of normal and disease processes, and the events and changes that occur in structure and function at the cellular level. This unit gives you the opportunity to explore these key aspects before proceeding to more advanced concepts in biotechnology. This unit aims to provide high level understanding of cellular processes and responses, as a fundamental basis for further postgraduate studies in cellular and molecular biosciences.

**Corequisites:** LSN101, LSN483  
**Credit points:** 12  
**Contact hours:** 4 per week  
**Campus:** Gardens Point  
**Teaching period:** 2011 SEM-2

LSN103 POSTGRADUATE LEARNING AND RESEARCH SKILLS
This unit assists you in developing a range of generic and specific skills and attributes to be a successful postgraduate student. On completion of the unit, you will: (i) know how to manage information tools and resources effectively in order to advance your university study and become an independent and competent learner (ii) build and increase your knowledge and competence in using basic software applications and general knowledge of information communication technologies and (iii) develop key skills in project design and management. This unit consists of a series of workshops, seminars and on-line tutorials presented by a team of teaching and learning support staff from across the university.
**LSN483 MOLECULAR BIOLOGY TECHNIQUES**
Fundamental and advanced skills in molecular biology are essential prerequisites for biotechnology. Through close alignment of theoretical concepts and practical skills, this strongly lab-oriented postgraduate unit allows you to develop expertise in modern recombinant DNA techniques and an understanding of strategies used to identify and manipulate genes. Integration between theory and practice in this unit is designed to develop competence, independence and high-order critical thinking skills so as to fully prepare you for the suite of advanced units in the Postgraduate Coursework Biotechnology programs. The overall aim of this unit is to develop concepts and laboratory skills in the characterisation and analysis of nucleic acids and recombinant DNA technologies and to extend these technologies into the understanding and application of the different strategies for gene discovery.

**Corequisites:** LSN101, LSN102  
**Assumed knowledge:** Students should enrol in either LSN101 or LSN102 in the same semester if not already completed.  
**Equivalents:** LQB483, LSB468  
**Credit points:** 12  
**Contact hours:** 4 per week  
**Campus:** Gardens Point  
**Teaching period:** 2011 SEM-2

**LSN583 GENETIC RESEARCH TECHNOLOGY**
The tools available for the discovery and manipulation of new genes are increasing exponentially and, in turn, this is having a significant impact in many areas of the life sciences. The true potential for this ultimately relies on the ability to link genes and their function. There are many strategies, both targeted and global, which facilitate an understanding of gene and genome structure function relationships. These strategies rely on integrated technologies based on molecular genetics, molecular biology and genetic engineering. The identification of function leads then to unlimited potential for detection and manipulation of these genes in human, animal and plant systems.

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

**LSN584 MEDICAL CELL BIOLOGY**
This unit builds and extends the understanding of basic theoretical and practical aspects of molecular cell biology developed in previous cell and molecular biology units. Medical Cell Biology develops and extends the context of the cellular environment and its central role within the organism providing all of the biological functions required by the organism to survive, defend and protect itself from disease and trauma. An understanding of cell biology theory and molecular mechanisms of animal development and disease is essential for introduction to higher level units in medical biotechnology.

**Prerequisites:** LSN101 and LSN102  
**Antirequisites:** LSB503, LSB449, LQB584  
**Credit points:** 12  
**Contact hours:** 4 per week  
**Campus:** Gardens Point  
**Teaching period:** 2011 SEM-1

**LSN585 PLANT GENETIC MANIPULATION**
The potential of plant biotechnology can only be recognised as a result of the significant advances being made in technologies enabling the genetic manipulation of plants. Familiarity with the strategies, techniques and breadth of applications is essential as a basis for anyone planning a career in plant biotechnology. The unit is designed with a significant emphasis on achieving technical expertise in plant genetic manipulation and control of gene expression.

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

**LSN684 MEDICAL BIOTECHNOLOGY 2**
Students undertaking Medical Biotechnology 2 should have a thorough understanding of diagnostics and therapeutics in the commercial environment of biotechnology. A comprehension of approaches and the applications used as therapeutic interventions in medicine is necessary for this understanding. This unit focuses on current state-of-the-art applications within therapeutic biotechnology as directed to novel drug discovery and drug optimisation and to the development of novel therapeutic strategies, such as gene therapy, transplantation and immunotherapy. It will prepare you for subsequent involvement in medical research and/or employment in medical laboratories. The aim of this unit is to enable you to acquire a thorough understanding of current and emerging strategies for therapeutic interventions in the treatment of disease.

**Prerequisites:** LSN101 and LSN102  
**Assumed knowledge:** LQB684  
**Credit points:** 12  
**Contact hours:** 4 per week  
**Campus:** Gardens Point  
**Teaching period:** 2011 SEM-2

**LSN710 PROJECT**
This unit includes a research project conducted in an area selected by the student in consultation with their supervisor(s) and the postgraduate coursework coordinator. The first part of the project involves compilation and writing of a critical Literature Review on the research topic focusing on clarification of knowledge gaps together with an outline of the planned research to follow. The second and major part of the project is the supervised research itself. A Research Project Report will be written in a style to evaluate and critically discuss the data. Prescriptive guidelines and submission deadlines must be followed for both the Literature Review document and the Research Project.
Our ability to test, screen and manipulate the human genome is made possible by recent technological breakthroughs in science. The science of genetics is not new, but its public profile has never been higher. Current initiatives in genetic knowledge have been described as an international voyage of scientific discovery. The scientific findings are prompting major rethinking of concepts of law and justice. The legal community faces a perpetual challenge in keeping pace with the revolution in genetics. This unit looks at some legal implications of this revolution and charts the major responses of our legal system to modern genetics and biotechnology.

**Credit points:** 12  
**Contact hours:** 26 hrs in total  
**Campus:** Gardens Point  
**Teaching period:** 2011 SEM-1

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**LSP127 BUSINESS ASPECTS OF BIOTECHNOLOGY**

Supporting a successful biotechnology industry in Australia requires an entrepreneurial framework to be developed which assists the efforts of both researchers and innovators. This unit integrates those essential entrepreneurial techniques of launching a biotechnology business. The unit focus is on the research and development of industrial products and commercialising innovations developed in this industry. On completion of this unit the student will be able to identify and analyse entrepreneurial opportunities and evaluate these opportunities within biotechnology together with the ability to identify and comprehend the steps involved in setting up a new biotechnology enterprise.

**Credit points:** 12  
**Contact hours:** 5 per week  
**Campus:** Gardens Point  
**Teaching period:** 2011 SEM-1

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**LWN135 LAW, JUSTICE AND NEW GENETIC TECHNOLOGIES**

Supporting a successful biotechnology industry in Australia requires an entrepreneurial framework to be developed which assists the efforts of both researchers and innovators. This unit integrates those essential entrepreneurial techniques of launching a biotechnology business. The unit focus is on the research and development of industrial products and commercialising innovations developed in this industry. On completion of this unit the student will be able to identify and analyse entrepreneurial opportunities and evaluate these opportunities within biotechnology together with the ability to identify and comprehend the steps involved in setting up a new biotechnology enterprise.

**Credit points:** 12  
**Contact hours:** 5 per week  
**Campus:** Gardens Point  
**Teaching period:** 2011 SEM-1