1. What is this course about?

1.1 Description
Microbial products such as antibiotics, microbial enzymes and bio-fuels contribute to global health and development. This course provides an overview of the diversity of microorganisms and their metabolic activities such as the microbial products of major social, economic and environmental importance. Laboratory practicals in this course complement the theory through testing microbial compounds, their effects on pathogens and their hydrolytic and degradative effects. Gain of laboratory skills is an essential component of the course as well as understanding the theory behind each experiment.

1.2 Course topics
The Big Picture; Applied and Environmental Microbiology and its place in sustainable global development
Biodiscovery of novel therapeutic agents and alternative therapies to combat superbugs
Marine biodiscovery and extremophiles and extremozymes
Bioremediation and biological control to replace environmentally hazardous chemicals
Microbial enzymes and industrial applications
Waste treatment, composting and landfills
Biofuels and biometallurgy
Advanced laboratory skills, ethics, communication and professionalism

2. What level is this course?
300 level Graduate - Independent application of graduate knowledge and skills. Meets AQF and professional requirements. May require pre-requisites and developing level knowledge/skills. Normally taken in the 3rd or 4th year of an undergraduate program

3. What is the unit value of this course?
12 units
### 4. How does this course contribute to my learning?

<table>
<thead>
<tr>
<th>Specific Learning Outcomes</th>
<th>Assessment tasks</th>
<th>Graduate Qualities or Professional Standards mapping</th>
</tr>
</thead>
<tbody>
<tr>
<td>On successful completion of this course, you should be able to:</td>
<td>You will be assessed on the learning outcomes in task/s:</td>
<td>Completing these tasks successfully will contribute to you becoming:</td>
</tr>
<tr>
<td>Demstrate and apply theoretical and practical knowledge of:</td>
<td>1. Early assessment exam</td>
<td>Sustainability Focussed</td>
</tr>
<tr>
<td>• production and large-scale applications of microbial metabolites</td>
<td>2. Mid-term Exam</td>
<td>Empowered</td>
</tr>
<tr>
<td>• innovative approaches &amp; strategies for discovering products of social, economic</td>
<td>4. Final exam</td>
<td>Knowledgeable</td>
</tr>
<tr>
<td>and environment importance</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Critically analyse data generated by isolating and testing microbial compounds to</td>
<td>3. Laboratory portfolio</td>
<td>Sustainability Focussed</td>
</tr>
<tr>
<td>determine:</td>
<td>4. Final Exam</td>
<td>Empowered</td>
</tr>
<tr>
<td>• their beneficial and detrimental effects</td>
<td></td>
<td>Knowledgeable</td>
</tr>
<tr>
<td>• their large-scale use for environmental regional and global sustainability</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• possible implications for decision making &amp; new biotechnologies</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Demonstrate advanced laboratory skills and biosafety adhering to ethical codes of</td>
<td>3. Laboratory portfolio</td>
<td>Empowered</td>
</tr>
<tr>
<td>conduct in data collection and analysis</td>
<td></td>
<td>Knowledgeable</td>
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<td></td>
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</tr>
</tbody>
</table>

### 5. Am I eligible to enrol in this course?

Refer to the [USC Glossary of terms](#) for definitions of “pre-requisites, co-requisites and anti-requisites”.

#### 5.1 Enrolment restrictions

Nil

#### 5.2 Pre-requisites

LFS261 or MBT263

#### 5.3 Co-requisites

Nil

#### 5.4 Anti-requisites

MBT363 or MBT364

#### 5.5 Specific assumed prior knowledge and skills (where applicable)

Competent laboratory skills and scientific report writing

### 6. How am I going to be assessed?

#### 6.1 Grading scale

Standard – High Distinction (HD), Distinction (DN), Credit (CR), Pass (PS), Fail (FL)
### 6.2 Assessment tasks

<table>
<thead>
<tr>
<th>Task No.</th>
<th>Assessment Tasks</th>
<th>Individual or Group</th>
<th>Weighting %</th>
<th>What is the duration / length?</th>
<th>When should I submit?</th>
<th>Where should I submit it?</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Early Assessment Exam</td>
<td>Individual</td>
<td>Formative</td>
<td>1 hour</td>
<td>Week 4</td>
<td>Tutorial Class</td>
</tr>
<tr>
<td>2</td>
<td>Mid-term Exam</td>
<td>Individual</td>
<td>20%</td>
<td>2 hours</td>
<td>Week 7</td>
<td>Lecture</td>
</tr>
<tr>
<td>3</td>
<td>Laboratory Portfolio</td>
<td>Individual</td>
<td>50%</td>
<td>a] 30min quiz b] 3000 words</td>
<td>a) Weeks 5, 7, 9, 11, 13 b) end of the semester</td>
<td>a) Laboratory b) to be submitted in the last practical (week 13) to the course coordinator as hard copy</td>
</tr>
<tr>
<td>4</td>
<td>Final Exam</td>
<td>Individual</td>
<td>30%</td>
<td>2 hours</td>
<td>Central Exam Period</td>
<td>Central exam room</td>
</tr>
</tbody>
</table>

#### Assessment Task 1: Early Assessment Quiz

**Goal:** This is an important quiz that has been specifically designed to expose you to the key foundational theoretical knowledge you need in this course. This formative quiz directly relates and assists you to be successful for the mid-term exam. **Covers the contents of lectures 1-3**

**Product:** Formative quiz

**Format:** Multiple choice exam – One Hour

**Criteria:**
- Demonstrate and apply theoretical and practical knowledge of:
  - antibiotics & resistance and the search for new microbial bioactive metabolites
  - alternative approaches & strategies to combat infectious diseases
  - types of microbial metabolites and principles of fermentation

**Generic skill assessed:** Problem solving  
**Skill assessment level:** Graduate

#### Assessment Task 2: Mid-term exam

**Goal:** This exam will allow you to demonstrate your knowledge of principles and strategies related to applications of microbiology (covered in lectures 1 to 6). Key ideas here will be theoretical and practical knowledge of:
- production and large-scale applications of microbial metabolites
- innovative approaches & strategies for discovering products of social, economic and environment importance

**Product:** 2-hour exam

**Format:** written exam composed of five essay questions

**Criteria:**
- Demonstrate and application of theoretical and practical knowledge of:
  - principles of fermentation
  - strategies and current issues related to bioremediation

Critical interpretation of information on:
- effectiveness of current antibiotic discovery strategies
- large scale production and application of microbial products in industrial context

**Generic skill assessed:** Problem solving  
**Skill assessment level:** Graduate
### Assessment Task 3: Laboratory Portfolio

| **Goal:** | This assessment has been designed for you to specifically develop your competencies in the laboratory— which is an essential skill for Biomed students and for many other disciplines in science. At the end of the course you should have graduate level competence in lab skills. |
| **Product:** | Laboratory quizzes and a laboratory report |
| **Format:** | **Laboratory quizzes:** 30 min exam after completion of each practical and a written exam composed of essay questions. Only students who actively participated in the laboratory activity can take these quizzes.  
**Laboratory report:**  
upto-3000 words.  
Individual  
On practical #1 (Assessment the effectivity of Antibiotics produced by Actinomycetes)) that adheres to the given report structure (rubric) to be provided by the Course-Coordinator |
| **Criteria:** | **Laboratory quizzes:**  
• Application of theoretical and practical knowledge gained in the practicals  
• Interpretation and analysis of data and related information (e.g. actinomycetes, bacteriophages, microbial enzymes, plant pathogenic fungi)  
**Laboratory report:**  
• Interpretation and analysis data and related information (e.g. actinomycete isolations from environment, cfu calculations)  
• Application of ethical codes of conduct to work safely while gaining laboratory skills and collecting data  
• Scientific communication |

| **Generic skill assessed** | **Skill assessment level** |
| Communication | Graduate |
| Organization | Graduate |
| Information literacy | Graduate |

### Assessment Task 4: Final Exam

| **Goal:** | You will demonstrate your culminating theoretical and practical knowledge of microbial products and processes in relevant industrial contexts (covered in lectures 7-13). This exam will also have you demonstrate your understanding of the social, economic and environmental importance of Microbiology and Biotechnology. |
| **Product:** | Final exam |
| **Format:** | 2-hour written examination composed of five essay questions |
| **Criteria:** | Application of theoretical and practical knowledge of:  
• production of microbial metabolites  
• innovative approaches & strategies for discovering products of social, economic and environment importance (e.g. biofuels, enzymes)  
Critical analysis of data generated by isolating and testing microbial compounds to determine:  
• their effects on environmental regional and global sustainability  
• possible implications for decision making & new biotechnologies |

| **Generic skill assessed** | **Skill assessment level** |
| Problem solving | Graduate |
### What are the course activities?

#### 7.1 Directed study hours
2-hour lecture per week, 1-hour tutorial per week, 2.5 hour laboratory practical every fortnight

#### 7.2 Teaching semester/session(s) offered
Semester 1

#### 7.3 Course content

<table>
<thead>
<tr>
<th>Teaching Week / Module</th>
<th>What key concepts/content will I learn?</th>
<th>What activities will I engage in to learn the concepts/content?</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>The Big Picture; Applied and Environmental Microbiology and its place in sustainable global development</td>
<td>Lecture and tutorial supplementary audio-visual material In addition, laboratory practicals during the semester will complement learning outcomes</td>
</tr>
<tr>
<td></td>
<td>Introduction to industrial microbiology, antibiotics and alternative treatments</td>
<td>Read relevant sections in your text book, refer to review questions to revise key points delivered in lecture</td>
</tr>
<tr>
<td></td>
<td>Biodiscovery from marine and extreme environments</td>
<td>Read relevant sections in your text book, refer to review questions to revise key points delivered in lecture</td>
</tr>
<tr>
<td>2</td>
<td>Industrial fermentation for pharmaceuticals (Part-I)</td>
<td>Lecture and tutorial, supplementary audio-visual material Laboratory practical 1 Assessment the effectiveness of Antibiotics produced by Actinomycetes</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Read relevant sections in your text book, refer to review questions to revise key points delivered in lecture</td>
</tr>
<tr>
<td>3</td>
<td>Industrial fermentation for pharmaceuticals (Part-II)</td>
<td>Lecture and tutorial, supplementary audio-visual material</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Read relevant sections in your text book, refer to review questions to revise key points delivered in lecture</td>
</tr>
<tr>
<td>4</td>
<td>Bioremediation</td>
<td>Lecture and tutorial, supplementary audio-visual material Laboratory practical-2: Bacterial enzymes and applications (QUIZ #1 starts here covering the contents of practical #1: Assessment the effectivity of Antibiotics produced by Actinomycetes)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Read relevant sections in your text book, refer to review questions to revise key points delivered in lecture</td>
</tr>
<tr>
<td>Week</td>
<td>Topic</td>
<td>Delivery Methods</td>
</tr>
<tr>
<td>------</td>
<td>--------------------------------------------</td>
<td>-------------------------------------------------------</td>
</tr>
<tr>
<td>6</td>
<td>Biodeterioration</td>
<td>Lecture and tutorial, supplementary audio-visual material</td>
</tr>
<tr>
<td>7</td>
<td>Plant pathogens and biological control (Part-I)</td>
<td>Lecture and tutorial, supplementary audio-visual material, Laboratory practical-3: bacteriophages and their applications (QUIZ #2 covering the contents of practical #2: Bacterial enzymes and applications)</td>
</tr>
<tr>
<td>8</td>
<td>Plant pathogens and safety aspects of biological control (Part-II)</td>
<td>Lecture and tutorial, supplementary audio-visual material</td>
</tr>
<tr>
<td>9</td>
<td>Bacterial Enzymes</td>
<td>Lecture and tutorial, supplementary audio-visual material, Laboratory practical-4: Detection of airborne actinomycetes from farm materials (QUIZ #3 covering the contents of practical #3: bacteriophages and their applications)</td>
</tr>
<tr>
<td>10</td>
<td>Microbiological aspects of liquid waste treatment</td>
<td>Lecture and tutorial, supplementary audio-visual material</td>
</tr>
<tr>
<td>11</td>
<td>Microbiological aspects of solid waste treatment</td>
<td>Lecture and tutorial, supplementary audio-visual material, Laboratory practical-5: Plant pathogenic fungi (QUIZ #4 covering the contents of practical #4: Detection of airborne actinomycetes from farm materials)</td>
</tr>
<tr>
<td>12</td>
<td>Biofuels</td>
<td>Lecture and tutorial, supplementary audio-visual material</td>
</tr>
</tbody>
</table>
## Course Outline: MBT336  Applied Microbiology and Biotechnology

| 13 | Biometallurgy | Lecture and tutorial, supplementary audio-visual material. An overview of the semester will also be provided. Laboratory practical-6: Final data collection and review of final results (QUIZ #5 covering the contents of practical #5: Plant pathogenic fungi) | Read relevant sections in your text book, refer to review questions to revise key points delivered in lecture |

Please note that the course activities may be subject to variation.

### 8. What resources do I need to undertake this course?

Please note that course information, including specific information of recommended readings, learning activities, resources, weekly readings, etc. are available on the course Blackboard site. Please log in as soon as possible.

#### 8.1 Prescribed text(s)

Please note that you need to have regular access to the resource(s) listed below as they are required:

<table>
<thead>
<tr>
<th>Author</th>
<th>Year</th>
<th>Title</th>
<th>Publisher</th>
</tr>
</thead>
</table>

#### 8.2 Required and recommended readings

**Required:**
1. Laboratory Manual prepared by the Course coordinator to be obtained from the USC’s MaPS

**Recommended:**

#### 8.3 Specific requirements

Protective clothing for laboratory and strict adherence to the laboratory safety guidelines

### 9. Risk management

Each student must complete an online laboratory health and safety quiz accessed via a link on Blackboard and hand into the Course Coordinator on entry to the first laboratory.

It is your responsibility as a student to review course material, search online, discuss with lecturers and peers, and understand the health and safety risks associated with your specific course of study. It is also your responsibility to familiarise yourself with the University's general health and safety principles by reviewing the [online Health Safety and Wellbeing training module for students](#), and following the instructions of the University staff.
10. **What administrative information is relevant to this course?**

10.1 **Assessment: Academic Integrity**

Academic integrity is the ethical standard of university participation. It ensures that students graduate as a result of proving they are competent in their discipline. This is integral in maintaining the value of academic qualifications. Each industry has expectations and standards of the skills and knowledge within that discipline and these are reflected in assessment.

Academic integrity means that you do not engage in any activity that is considered to be academic fraud; including plagiarism, collusion or outsourcing any part of any assessment item to any other person. You are expected to be honest and ethical by completing all work yourself and indicating in your work which ideas and information were developed by you and which were taken from others. You cannot provide your assessment work to others. You are also expected to provide evidence of wide and critical reading, usually by using appropriate academic references.

In order to minimise incidents of academic fraud, this course may require that some of its assessment tasks, when submitted to Blackboard, are electronically checked through SafeAssign. This software allows for text comparisons to be made between your submitted assessment item and all other work that SafeAssign has access to.

10.2 **Assessment: Additional requirements**

**Eligibility for Supplementary Assessment**

Your eligibility for supplementary assessment in a course is dependent on the following conditions applying:

a) The final mark is in the percentage range 47% to 49.4%

b) The course is graded using the Standard Grading scale

c) You have not failed an assessment task in the course due to academic misconduct

10.3 **Assessment: Submission penalties**

Late submission of assessment tasks will be penalised at the following maximum rate:

- 5% (of the assessment task’s identified value) per day for the first two days from the date identified as the due date for the assessment task.
- 10% (of the assessment task’s identified value) for the third day
- 20% (of the assessment task’s identified value) for the fourth day and subsequent days up to and including seven days from the date identified as the due date for the assessment task.
- A result of zero is awarded for an assessment task submitted after seven days from the date identified as the due date for the assessment task.

Weekdays and weekends are included in the calculation of days late.

To request an extension, you must contact your Course Coordinator and supply the required documentation to negotiate an outcome.

10.4 **Study help**

In the first instance, you should contact your tutor, then the Course Coordinator. Additional assistance is provided to all students through Academic Skills Advisers. To book an appointment or find a drop-in session go to Student Hub.

Contact Student Central for further assistance: +61 7 5430 2890 or studentcentral@usc.edu.au
10.5 Links to relevant University policy and procedures
For more information on Academic Learning & Teaching categories including:

- Assessment: Courses and Coursework Programs
- Review of Assessment and Final Grades
- Supplementary Assessment
- Administration of Central Examinations
- Deferred Examinations
- Student Academic Misconduct
- Students with a Disability

Visit the USC website:
http://www.usc.edu.au/explore/policies-and-procedures#academic-learning-and-teaching

10.6 General Enquiries
In person:
- USC Sunshine Coast - Student Central, Ground Floor, Building C, 90 Sippy Downs Drive, Sippy Downs
- USC SouthBank - Student Central, Building A4 (SW1), 52 Merivale Street, South Brisbane
- USC Gympie - Student Central, 71 Cartwright Road, Gympie
- USC Fraser Coast - Student Central, Student Central, Building A, 161 Old Maryborough Rd, Hervey Bay

Tel: +61 7 5430 2890
Email: studentcentral@usc.edu.au