COURSE OUTLINE

MBT353 Microbial Pathogenesis

School: School of Science, Technology and Engineering

2025 | Semester 2

UniSC Sunshine Coast
UniSC Moreton Bay

BLENDED LEARNING

Most of your course is on campus but you may be able to do some components of this course online.

Please go to usc.edu.au for up to date information on the teaching sessions and campuses where this course is usually offered.

1. What is this course about?

1.1. Description

This course examines bacterium-host relationships and explores virulence factors that promote colonisation and survival of infecting microorganisms and virulence attributes that damage the host. The course explores experimental approaches for investigating bacterium-host interrelationships, cultured cell lines and lab animals and their application in studying microbial pathogenicity. The course also explores challenges facing vaccine development and discovering antibiotics. The molecular pathogenesis of selected pathogens and the importance of normal microbiota and probiotics are discussed

1.2. How will this course be delivered?

ACTIVITY	HOURS	BEGINNING WEEK	FREQUENCY
BLENDED LEARNING			
Learning materials – Asynchronous Learning Materials	2hrs	Week 1	13 times
Tutorial/Workshop 1 – on campus Tutorial/Workshop	1hr	Week 1	13 times
Laboratory 1 – This is an intensive practical class that will take place at the Sunshine Coast campus for both Moreton Bay and Sunshine Coast Cohorts. Due to the need to convert labs to PC2, these labs will be held during the mid Semester break only.	12hrs	Break week	Once Only
Laboratory 2 – Catch up discussion and analyses of data obtained in the lab during the intensive	1hr	Break week	Once Only

1.3. Course Topics

History of bacteria and their genetic diversity, Host-Pathogen interactions, The first line of defence against bacterial invasion, Studying bacterial diseases (Models to study colonisation and colonization resistance), Virulence factors that promote bacterial colonisation of the host and their survival, Factors that damages the host (bacterial toxins and their function), Vaccines and challenges ahead (The current vaccine situation and future direction), Bacterial secretion systems and their role in pathogenesis, Quroum sensing in bacteria, Specific mechanism of action of bacterial pathogens, 1-Group A and B streptococci and enterococci, 2- UPEC and Urinary tract 3- Helicobacter pylori

2. What level is this course?

300 Level (Graduate)

Demonstrating coherence and breadth or depth of knowledge and skills. Independent application of knowledge and skills in unfamiliar contexts. Meeting professional requirements and AQF descriptors for the degree. May require pre-requisites where discipline specific introductory or developing knowledge or skills is necessary. Normally undertaken in the third or fourth full-time study 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?

COURSE LEARNING OUTCOMES		GRADUATE QUALITIES
On successful completion of this course, you should be able to...		Completing these tasks successfully will contribute to you becoming...
1	Identify the genetic diversity of bacteria, and experimental approached used to study pathogenesis of bacteria and describe the virulence attributes of bacteria that are involved in colonisation and damaging the host, their mechanism of action and host defence.	Knowledgeable
2	Analyse and evaluate experimental approaches used for assessing the pathogenicity of bacteria.	Creative and critical thinker
3	Analyse and describe the mechanism of bacterium-host interaction using examples of infectious diseases as a guideline.	Empowered
4	Describe challenges of developing efficient vaccines and discovering new antibiotics and their mechanism of actions.	Creative and critical thinker
5	Describe how bacteria communicate with each other and with the host to cause infection and identify major mechanisms of pathogenicity of infectious diseases as well as how normal microflora work to protect colonisation of the body by pathogens.	Knowledgeable
6	Demonstrate effective communication and analyses of results	Engaged

5. Am I eligible to enrol in this course?

Refer to the UniSC Glossary of terms for definitions of “pre-requisites, co-requisites and anti-requisites”.

5.1. Pre-requisites

MBT263 or LFS261 or (MLS200 and enrolled in UB001)

5.2. Co-requisites

Not applicable

5.3. Anti-requisites

MEP351

5.4. Specific assumed prior knowledge and skills (where applicable)

General knowledge about the structure of bacteria, their growth mechanism as well as basic skills in cultivation and aseptic transfer of bacteria

6. How am I going to be assessed?

6.1. Grading Scale

Standard Grading (GRD)

High Distinction (HD), Distinction (DN), Credit (CR), Pass (PS), Fail (FL).

6.2. Details of early feedback on progress

The course will include an early formative assessment on week four. The formative quiz will be based on materials covered during the first three weeks and discussed in detail in tutorial classes. Responses to early quiz will be peer reviewed to evaluate students' academic progress, including identifying the need for additional support.

6.3. Assessment tasks

DELIVERY MODE	TASK NO.	ASSESSMENT PRODUCT	INDIVIDUAL OR GROUP	WEIGHTING %	WHAT IS THE DURATION / LENGTH?	WHEN SHOULD I SUBMIT?	WHERE SHOULD I SUBMIT IT?
All	1	Quiz/zes	Individual	0%	30 minutes	Week 4	In Class
All	2	Examination - not Centrally Scheduled	Individual	30%	1 hour	Week 7	In Class
All	3a	Oral	Group	20%	10 minutes	Refer to Format	In Class
All	3b	Written Piece	Group	15%	200 words plus title and key words	Week 10	Online Submission
All	4	Examination - Centrally Scheduled	Individual	35%	2 hours	Exam Period	Exam Venue

All - Assessment Task 1: Early quiz

GOAL:	To assess your ability to describe the importance of bacterial genetic diversity and their ability to adapt to different hosts as well as the role of each virulence property of bacteria to interact with their host
PRODUCT:	Quiz/zes
FORMAT:	A 30 minute, in class multiple choice quiz
CRITERIA:	

No.		Learning Outcome assessed
1	Correctly describe how bacteria evolved their genetic diversity and how they were adapted to live in the body of warm-blooded animals	1
2	Accurately describe the importance of each virulence property of bacteria to colonize the host and survive the immune system	5

GENERIC SKILLS:	

All - Assessment Task 2: Mid-semester exam

GOAL:	To assess your ability to describe virulence factors of bacteria that are involved in colonisation and damaging the host, as well as host defence and experimental approach to assess pathogenicity of bacteria
PRODUCT:	Examination - not Centrally Scheduled
FORMAT:	Short answer questions
CRITERIA:	

No.		Learning Outcome assessed
1	Correct description of virulence factors of bacteria and identifying which ones are involved in colonisation or damaging the host	5
2	Accurate analysis of experimental approach used for assessing pathogenic properties of bacteria and description of challenges facing discovering new antibiotics and vaccines and their mode of actions	2

GENERIC SKILLS:	

All - Assessment Task 3a: Oral presentation and critical evaluation of published papers

GOAL:	To assess your ability to scientifically analyse the mechanism of bacterium-host interaction using infectious diseases as a guideline
PRODUCT:	Oral
FORMAT:	You will be working as a team (2-3 per team). Presentation will be in the format of a power point describing a research article assigned to the group, all within 10 minutes. All members of the team should contribute to the oral presentation equally and present equally. Submission weeks 11 & 12

CRITERIA:

No.		Learning Outcome assessed
1	An informative description of the research subject including introduction, methodology and results followed by a critical analysis of the data	2
2	The ability to summarise the research study and critically analyse a research article within the time limit of the assessment task	6
3	Evidence of collaboration and organisation of the presentation	6
4	The ability to communicate (visual and oral) with audience	6

GENERIC SKILLS:

All - Assessment Task 3b: Critical evaluation and summarizing a research article

GOAL:	To assess your ability to present an advanced scientific research article related to bacterium-host interaction in a succinct and informative manner
PRODUCT:	Written Piece
FORMAT:	You will be working as a team of 2 or 3 to prepare an abstract. The abstract should include a "title" that represent the scientific finding of the research article and contains 5 key words, a running title (40 characters without space) and 4 sections i.e.Objectives, Material and Methods, Results, and Conclusion all in 200 words

CRITERIA:

No.		Learning Outcome assessed
1	The ability to understand the synthesis the mechanism of bacterial interaction with the host	3
2	Presenting an informative introduction to the problem and methodology	2
3	Scientific analyses of results and presentation of important aspects of them	2
4	Conclusion and justification of findings	6

GENERIC SKILLS:

All - Assessment Task 4: Final exam

GOAL:	To assess your ability to describe the routes of discovering antibiotics, vaccines and their mode of actions and the mechanisms by which pathogens communicate with each other and identifying pathogenic mechanisms of common infectious diseases as well as describing mechanisms by which microflora protect the host against pathogens
PRODUCT:	Examination - Centrally Scheduled
FORMAT:	The exam will be based on the materials covered in weekly learning material, literature reviews, notes and the prescribed Text Book between weeks 7 and 13. The exam questions will be in the format of short answer questions and will be during the examination period at the end of semester for 2 hours. There will also be additional questions from laboratory practical book
CRITERIA:	
GENERIC SKILLS:	

No.		Learning Outcome assessed
1	Accurate description of the mechanisms that bacteria communicate with each other and the host,	5
2	Providing concise and accurate description of the pathogenic mechanisms of common infectious diseases as well as the role of microbiota in protecting host.	5
3	Correct description of the theoretical aspects of laboratory tests used for identification of bacterial virulence factors.	4

7. Directed study hours

A 12-unit course will have total of 150 learning hours which will include directed study hours (including online if required), self-directed learning and completion of assessable tasks. Student workload is calculated at 12.5 learning hours per one unit.

7.1. Schedule

PERIOD AND TOPIC	ACTIVITIES
W1	An introduction to Host-Parasite Interaction (History of bacteria and their genetic diversity)
W2	Host-Pathogen interactions (microbial pathogenesis)
W3	The first line of defence against bacterial invasion (Prevention and phagocytic cell response)
W4	Studying bacterial diseases (Models to study colonisation and colonization resistance)
W5	Virulence factors that promote bacterial colonisation of the host and their survival
W6	Virulence factors that damages the host (bacterial toxins and their function)
W7	Mid-semester exam Vaccines and challenges ahead (The current vaccine situation and future direction
W8	Antibiotics, discovery and the challenges of emerging resistant pathogens
W9	Human microbiota and their role in health and disease, with special reference to gut microbiota)
W10	Probiotics; a new era of biotherapy
PC2 Practicals	1-Techniques for enumerating bacteria and eukaryotic cells. Measuring biofilm formation by bacteria 2- Identification of virulence properties of bacteria (role of type 1 fimbriae, mannose-resistant haemagglutination adherence and haemolysin in pathogenesis of E. coli) 3-Determination of Penicillin activity in the presence and absence of penicillinase and minimum inhibitory concentration 4- Cell cultures and their role to identify virulence properties of bacteria (Bacterial adhesion to Caco2 and Hep-2 cells)
W11	Bacterial secretion systems and their role in pathogenesis
W12	Mechanism of action of bacterial pathogens and diseases, 1- Group A and B streptococci and enterococci, and Bordetella pertussis
W13	Mechanism of action of bacterial pathogens and diseases: Helicobacter pylori and Vibrio cholerae

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

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

8.1. Prescribed text(s) or course reader

Please note that you need to have regular access to the resource(s) listed below. Resources may be required or recommended.

REQUIRED?	AUTHOR	YEAR	TITLE	EDITION	PUBLISHER
Required	Brenda A. Wilson,Malcolm Winkler,Brian T. Ho	2019	Bacterial Pathogenesis	4th edition.	ASM Press

8.2. Specific requirements

It is the responsibility of students to attend practical classes on time and have lab coat and proper clothing e.g. proper shoes. Students who do not have lab coat or proper shoes will not be allowed to enter the practical lab classes

9. How are risks managed in this course?

Risk assessments have been performed for all laboratory classes and a moderate level of health and safety risk exists. Moderate risks are those associated with laboratory work such as working with chemicals and hazardous substances. You will be required to undertake laboratory induction training and it is also your responsibility 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 and to familiarise yourself with the University's general health and safety principles by reviewing the online induction training 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 Canvas, are electronically checked through Turnitin. This software allows for text comparisons to be made between your submitted assessment item and all other work to which Turnitin has access.

10.2. Assessment: Additional Requirements

Eligibility for Supplementary Assessment

Your eligibility for supplementary assessment in a course is dependent of the following conditions applying:
(a) The final mark is in the percentage range 47% to 49.4%; and
(b) The course is graded using the Standard Grading scale

10.3. Assessment: Submission penalties

Late submissions may be penalised up to and including the following maximum percentage of the assessment task's identified value, with weekdays and weekends included in the calculation of days late:
(a) One day: deduct 5%;
(b) Two days: deduct 10%;
(c) Three days: deduct 20%;
(d) Four days: deduct 40%;
(e) Five days: deduct 60%;
(f) Six days: deduct 80%;
(g) Seven days: A result of zero is awarded for the assessment task.

The following penalties will apply for a late submission for an online examination:
Less than 15 minutes: No penalty
From 15 minutes to 30 minutes: 20% penalty
More than 30 minutes: 100% penalty

10.4. SafeUniSC

UniSC is committed to a culture of respect and providing a safe and supportive environment for all members of our community. For immediate assistance on campus contact SafeUniSC by phone: 07 5430 1168 or using the SafeZone app. For general enquires contact the SafeUniSC team by phone 07 5456 3864 or email safe@usc.edu.au.

The SafeUniSC Specialist Service is a Student Wellbeing service that provides free and confidential support to students who may have experienced or observed behaviour that could cause fear, offence or trauma. To contact the service call 07 5430 1226 or email studentwellbeing@usc.edu.au.

10.5. Study help

For help with course-specific advice, for example what information to include in your assessment, you should first contact your tutor, then your course coordinator, if needed.

If you require additional assistance, the Learning Advisers are trained professionals who are ready to help you develop a wide range of academic skills. Visit the Learning Advisers web page for more information, or contact Student Central for further assistance: +61 7 5430 2890 or studentcentral@usc.edu.au.

10.6. Wellbeing Services

Student Wellbeing provide free and confidential counselling on a wide range of personal, academic, social and psychological matters, to foster positive mental health and wellbeing for your academic success.

To book a confidential appointment go to Student Hub, email studentwellbeing@usc.edu.au or call 07 5430 1226.

10.7. AccessAbility Services

Ability Advisers ensure equal access to all aspects of university life. If your studies are affected by a disability, learning disorder mental health issue, injury or illness, or you are a primary carer for someone with a disability or who is considered frail and aged, AccessAbility Services can provide access to appropriate reasonable adjustments and practical advice about the support and facilities available to you throughout the University.

To book a confidential appointment go to Student Hub, email AccessAbility@usc.edu.au or call 07 5430 2890.

10.8. 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
- Central Examinations
- Deferred Examinations
- Student Conduct
- Students with a Disability

For more information, visit https://www.usc.edu.au/explore/policies-and-procedures#academic-learning-and-teaching

10.9. Student Charter

UniSC is committed to excellence in teaching, research and engagement in an environment that is inclusive, inspiring, safe and respectful. The Student Charter sets out what students can expect from the University, and what in turn is expected of students, to achieve these outcomes.

10.10. General Enquiries

In person:

- **UniSC Sunshine Coast** - Student Central, Ground Floor, Building C, 90 Sippy Downs Drive, Sippy Downs
- **UniSC Moreton Bay** - Service Centre, Ground Floor, Foundation Building, Gympie Road, Petrie
- **UniSC SouthBank** - Student Central, Building A4 (SW1), 52 Merivale Street, South Brisbane
- **UniSC Gympie** - Student Central, 71 Cartwright Road, Gympie
- **UniSC Fraser Coast** - Student Central, Student Central, Building A, 161 Old Maryborough Rd, Hervey Bay
- **UniSC Caboolture** - Student Central, Level 1 Building J, Cnr Manley and Tallon Street, Caboolture

Tel: +61 7 5430 2890

Email: studentcentral@usc.edu.au