



The University of Southern Queensland

Course specification

| Description: Plant-Microbe Interactions | | | | | | |
|--|---------|-------|---------|------|-------|-----------|
| Subject | Cat-nbr | Class | Term | Mode | Units | Campus |
| BIO | 3318 | 54994 | 2, 2006 | ONC | 1.00 | Toowoomba |

| | |
|-----------------------------------|--------|
| Academic group: | FOSCI |
| Academic org: | FOS002 |
| Student contribution band: | 2 |
| ASCED code: | 010903 |

STAFFING

Examiner: Mark Sutherland

Moderator: John Dearnaley

REQUISITES

Pre-requisite: BIO1101

OTHER-REQUISITES

Recommended Pre-requisite: BIO2202 and BIO2103 Recommended Co-requisite: BIO2205

RATIONALE

1. Plant-microbe interactions are a central feature of the life of plants and range from advantageous symbiotic associations through to pathogenic disease states. 2. An understanding of these interactions is essential for both commercial plant production and native vegetation management. 3. This course examines the defining features of the most critical associations and highlights their dynamic nature.

SYNOPSIS

THIS COURSE IS OFFERED IN EVEN-NUMBERED YEARS ONLY. The principal groups of micro-organisms which interact with plants are surveyed, particularly the fungi. Symbiotic interactions (notably those with nitrogen fixing bacteria and mycorrhizal fungi), the role of endophytes and the significance of the rhizosphere are described. A major emphasis is placed on the nature of plant pathogenesis, the disease cycle and the genetics and physiology of plant disease resistance.

OBJECTIVES

On completion of this course students will be able to:

1. demonstrate an understanding of the major taxonomic classes of eucaryotic microorganisms involved in plant-microbe interactions;

2. demonstrate an understanding of the principal factors underlying plant-microbe interactions and the importance of plant-microbe symbiotic relationships in the life of plants;
3. demonstrate and understanding of the principles of plant pathogenesis;
4. demonstrate competency in laboratory and glasshouse work related to the analysis of plant-associated micro-organisms;
5. report scientific information and research results both orally and in writing in a clear, concise and rigorous manner.

TOPICS

| | Description | Weighting (%) |
|----|---|---------------|
| 1. | Introduction to plant-microbe associations - types of interactions - important taxonomic groups - major fungal taxa | 20.00 |
| 2. | Symbiotic and non-pathogenic associations - life in the rhizosphere - nitrogen fixing organisms - mycorrhizal fungi - the phyllosphere - endophytes | 20.00 |
| 3. | Plant Pathology and the development of disease - defining disease, disease symptoms and terminology - the disease cycle; how pathogens attack plants (mechanical and chemical weapons) - the effect of pathogens on the physiology of the host - the dispersal of pathogen inoculum | 20.00 |
| 4. | Disease Resistance - the genetics of resistance - structural and biochemical resistance mechanisms - systemic acquired resistance | 25.00 |
| 5. | Case studies 1 - <i>Agrobacterium tumefaciens</i> - crown gall disease 2 - Major diseases of cereals | 8.00 |
| 6. | Epidemiology and the environment | 7.00 |

TEXT and MATERIALS required to be PURCHASED or ACCESSED

ALL textbooks and materials are available for purchase from USQ BOOKSHOP (unless otherwise stated). Orders may be placed via secure internet, free fax 1800642453, phone 07 46312742 (within Australia), or mail. Overseas students should fax +61 7 46311743, or phone +61 7 46312742. For costs, further details, and internet ordering, use the 'Textbook Search' facility at <http://bookshop.usq.edu.au> click 'Semester', then enter your 'Course Code' (no spaces).

Agrios, GN 2005, *Plant Pathology*, 5th edn, Academic Press, San Deigo.

Pechenik, JA 2004, *A Short Guide to Writing about Biology*, 5th edn, Longman, Boston.

REFERENCE MATERIALS

Reference materials are materials that, if accessed by students, may improve their knowledge and understanding of the material in the course and enrich their learning experience.

Agrawal, Tuzun, S & Bent, E 1999, *Induced Plant Defenses Against Pathogens and Herbivores: Biochemistry, Ecology and Agriculture*, APS Press, St Paul.

(ISBN 0-89054-242-2)

Alexopoulos, CJ, Mims, CW & Blackwell, M 1996, *Introductory Mycology*, 4th edn, Wiley, New York.

Arora, DK & Khachatourians, GG 2003, *Applied Mycology and Biotechnology: Fungal Genomics*, Elsevier, Vol 3.

(ISBN 0-444-51442-2)

Brown, JF & Ogle, HJ (eds) 1997, *Plant Pathogens and Plant Diseases*, Rockvale Publications, Armidale.

de Wit, PJGM, Bisseling, T & Stiekema, WJ 2000, *Biology of Plant-Microbe Interactions*,

Jennings, DH & Lysek, G 1999, *Fungal Biology: Understanding the Fungal Lifestyle*, 2nd edn, Bios Scientific Publishers, Oxford.

Keen, NT, Mayama, S, Leach, JE & Tsuyumu, S 2001, *Delivery and Perception of Pathogen Signals in Plants*, American Phytopathological Society, St Paul, Minnesota.

Kendrick, B 1992, *The Fifth Kingdom*, 2nd edn, Mycologue Publication, Waterloo.

Lucas, JA 1998, *Plant Pathology and Plant Pathogens*, 3rd edn, Blackwell Science, Malden, Mass.

Podila, GK & Douds, DD 2000, *Current Advances in Mycorrhizae Research*, APS Press, St Paul, Minn.

Prell, HH & Day, P 2001, *Plant-Fungal Pathogen Interaction: A Classical and Molecular View*, Springer-Verlag,

Shurtleff, MC & Averre, CW 1997, *Glossary of Plant Pathological Terms*, APS Press, St Paul, Minn.

Smith, SE & Read, DJ 1996, *Mycorrhizal Symbiosis*, Academic Press, London.

Stacey, G & Keen, NT 2000, *Plant-Microbe Interactions*, Vol 5.

Trigiano, RN, Windham, MT & Windham, AS 2003, *Plant Pathology: Concepts and Laboratory Exercises*, CRC Press,

(ISBN 0-8493-1037-7)

Varma, A & Hock, B (eds) 1999, *Mycorrhiza: Structure, Function, Molecular Biology and Biotechnology*, 2nd edn, Springer-Verlag, Berlin.

Watling, R 2003, *Fungi: Life Series*, CSIRO Publishing,

(Natural History Museum ISBN 0-565-09182-4)

STUDENT WORKLOAD REQUIREMENTS

| ACTIVITY | HOURS |
|---------------------------------|-------|
| Assessment | 40.00 |
| Examinations | 3.00 |
| Laboratory or Practical Classes | 30.00 |
| Lectures | 24.00 |
| Private Study | 60.00 |

ASSESSMENT DETAILS

| Description | Marks out of | Wtg(%) | Due date |
|-------------------------------|--------------|--------|-----------------------------|
| 1 WRITTEN REPORT ON PRAC EXER | 20.00 | 10.00 | 24 Jul 2006 (see note 1) |
| SPECIMEN COLLECTION | 15.00 | 15.00 | 24 Jul 2006 (see note 2) |
| 1 HOUR MID-SEMESTER TEST | 50.00 | 25.00 | 11 Sep 2006 (see note 3) |
| 2 HOUR CLOSED EXAMINATION | 120.00 | 50.00 | END S2 (see note 4) |

NOTES

1. Examiner to advise due date for written report
2. Examiner to advise due date for specimen collection.
3. To be held during laboratory session.
4. Examination dates will be available during the Semester. Please refer to the examination timetable when published.

IMPORTANT ASSESSMENT INFORMATION

- 1 Attendance requirements:
It is the students' responsibility to attend and participate appropriately in all activities (such as lectures, tutorials, laboratories and practical work) scheduled for them, and to study all material provided to them or required to be accessed by them to maximise their chance of meeting the objectives of the course and to be informed of course-related activities and administration. To maximize their chances of satisfying the objectives of the practical component of the course, students should attend and actively participate in the laboratory sessions in the course.
- 2 Requirements for students to complete each assessment item satisfactorily:
To complete each of the assessment items satisfactorily, students must obtain at least 50% of the marks available for each assessment item.
- 3 Penalties for late submission of required work:
If students submit assignments after the due date without prior approval then a penalty of 10% of the total marks available for the assignment will apply for each working day late.
- 4 Requirements for student to be awarded a passing grade in the course:
To be assured of a passing grade, students must demonstrate, via the summative assessment items, that they have achieved the required minimum standards in relation to the objectives of the course by: (i) satisfactorily completing the examination and assignments; and (ii) obtaining at least 50% of the total weighted marks available for all summative assessment items. Students who do not qualify for a Passing grade may, at the discretion of the Examiner, be awarded a Supplementary Examination and/or assigned additional work to demonstrate to the Examiner that they have achieved the required standard. It is expected that such students will have gained at least 45 % of the total marks available for all summative assessment items.
- 5 Method used to combine assessment results to attain final grade:
The final grades for students will be assigned on the basis of the weighted aggregate of the marks obtained for each of the summative assessment items in the course.
- 6 Examination information:

In a Closed Examination, candidates are allowed to bring only writing and drawing instruments into the examination.

- 7 Examination period when Deferred/Supplementary examinations will be held:
Any Deferred or Supplementary examinations for this course will be held during the examination period at the end of the semester 3 following this course offering.
- 8 University Regulations:
Students should read USQ Regulations 5.1 Definitions, 5.6. Assessment, and 5.10 Academic Misconduct for further information and to avoid actions which might contravene University Regulations. These regulations can be found at the URL <http://www.usq.edu.au/corporateservices/calendar/part5.htm> or in the current USQ Handbook.

ASSESSMENT NOTES

- 9 In order to attend laboratory classes, students must provide and wear appropriate personal protective equipment. This shall include a laboratory coat, closed in shoes, and safety glasses. Such equipment must be approved by supervising staff. Failure to provide and wear the appropriate safety equipment will result in students being excluded from classes.
- 10 The due date for an assignment is the date by which a student must despatch the assignment to the USQ. The onus is on the student to provide proof of the despatch date, if requested by the Examiner. Students must retain a copy of each item submitted for assessment. If requested by the Examiner, students will be required to provide a copy of assignments submitted for assessment purposes. Such copies should be despatched to USQ within 24 hours of receipt of a request being made. The examiner of a course may grant an extension of the due date of an assignment in extenuating circumstances.