



The University of Southern Queensland

## Course specification

The current and official versions of the course specifications are available on the web at <http://www.usq.edu.au/coursespecification/current>.  
Please consult the web for updates that may occur during the year.

### Description: Plant Breeding

Subject	Cat-nbr	Class	Term	Mode	Units	Campus
BIO	3307	78941	2, 2008	EXT	1.00	Toowoomba

<b>Academic group:</b>	FOSCI
<b>Academic org:</b>	FOS002
<b>Student contribution band:</b>	2
<b>ASCED code:</b>	010999

### STAFFING

Examiner: Grant Daggard  
Moderator: Mark Sutherland

### REQUISITES

Pre-requisite: BIO2209 Co-requisite: BIO2207

### RATIONALE

Agriculture is one of Australia's major industries and the Darling Downs region is a centre for several important government and commercial plant breeding organisations. The course is designed to introduce the student to the principles and practice of plant breeding and to associated areas of plant diversity, speciation and taxonomy and the evolution of important crop plants. These principles and practices form an essential part of the training of Plant Biologists.

### SYNOPSIS

The course allows students to develop skills in both the theoretical and practical aspects of plant breeding. The course commences with a review of the historical importance of plant breeding. This is followed by a review of conventional strategies for plant breeding and the application of recent advances in plant biotechnology (particular DNA markers) to enhance the efficiency of selection within such breeding programs. The course concludes with a review of plant genetic engineering and its major applications to date. Practical work in the course, via a residential workshop, includes a study of plant breeding strategies, the isolation of plant DNA and generation of molecular markers. This is followed by a series of visits to local plant breeding field stations. During the course, the history and evolution of several major crops is followed to demonstrate the practical application of many theoretical concepts in plant breeding.

### OBJECTIVES

On successful completion of this course students will be able to:

1. demonstrate basic botanical knowledge of plant variability, taxonomy, speciation and selection (Problem Sets; Test; Exam);

2. demonstrate knowledge of a basic background in the methodology of plant introduction, quarantine, breeding techniques, the generation of variability, and breeding for disease resistance (Essay; Test; Exam);
3. demonstrate knowledge of approaches to undertaking successful plant breeding programs (Essay; Test; Exam);
4. demonstrate practical and theoretical skills in the application of molecular biology to plant breeding (Problem Sets; Test; Exam).

## TOPICS

	Description	Weighting (%)
1.	Brief history of the development of plant breeding and centres of variation.	5.00
2.	Commercial aspects of plant breeding: Cultivar release and plant variety rights; Conservation of plant genetic resources.	5.00
3.	Genetic structure of plants: Chromosomal and extra-chromosomal inheritance; Ploidy in plants; Interspecific hybridization	15.00
4.	Genetic variation in plants and its assessment: Qualitative inheritance in plants; Mapping: Isozymes, RFLP's and RAPD's.	25.00
5.	Quantitative inheritance in plants; Genotype x Environment interaction; Genetic basis of selection theory; Response to selection; Heterosis and inbreeding; Statistical and field techniques in plant breeding.	25.00
6.	Plant breeding strategies: Self-pollinating crops; Cross-pollinating crops; Synthetic varieties.	25.00

## 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).

Pechenik, JA 2007, *A short guide to writing about biology*, 6th edn, Longman, Boston.  
(ISBN: 0 321 07843 8)

## 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.

Abbot, AJ & Atkin, RK (eds) 1987, *Improving vegetatively propagated crops*, Academic Press, London.  
(ISBN: 0-12-041410-4)

Allard, RW 1999, *Principles of plant breeding*, 2nd edn, John Wiley & Sons, New York.

(ISBN: 0-471-02309-4)

Forbes, JC & Watson, RD 1992, *Plants in agriculture*, Cambridge University Press, Cambridge.  
(ISBN: 0-521-427916)

Gomez, KA & Gomez, AA 1984, *Statistical procedures for agricultural research*, 2nd edn, Wiley, New York.

(ISBN: 0-471-87931-2)

Gresshoff, PM (ed) 1994, *Plant genome analysis*, CRC Press, Boca Raton, Fla.

(ISBN: 0-8493-8264-5)

Grierson, D (ed) 1991, *Plant genetic engineering*, Chapman and Hall, New York.

Grierson, D & Covey, SN 1988, *Plant molecular biology*, 2nd edn, Blackie Publish, Glasgow.

(ISBN 0-7514-0144-7)

Gupta, PK & Varshney, RK (eds) 2004, *Cereal genomics*, Springer,

(ISBN: 1 4020 2358 8 Electronic book via netLibrary on USQ Library)

Hartmann, HT, Kester, DE & Davies, FT 1990, *Plant propagation: principles and practices*, 5th edn, Prentice Hall Publish, Englewood Cliffs, NJ.

Hayward, MD, Bosemark, NO & Romagosa, I (eds) 1993, *Plant breeding: principles and prospects*, Chapman and Hall, New York.

(ISBN 0-412-43390-7)

Jessop, RS & Wright, RL (eds) 1991, *New crops: agronomy and potential alternative crop species*, Inkata, Melbourne.

(ISBN 0-90960-580-7)

Kearsey, MJ & Pooni, HS 1996, *The genetical analysis of quantitative traits*, Chapman and Hall Publishers, London.

(ISBN: 0-412-6098-0)

Lorz, H & Wenzel, G (eds) 2004, *Molecular marker systems in plant breeding and crop improvement*, Springer-Verlag, Vol 55.

(ISBN: 3 540 20689 2)

Marshall, G & Walters, D (eds) 1994, *Molecular biology in crop protection*, Chapman and Hall Publishers, London.

(ISBN: 0-412-54390-7)

OECD 1993, *Traditional crop breeding practices: a historical review*, OECD, Paris.

(ISBN: 92-641-4074-6)

Paterson, AH 1996, *Genome mapping in plants*, Landes Publishing, Austin, Texas.

(ISBN: 0-12-546590-4)

Pearson, C, Cunningham, G & King, D 1993, *A plain English guide to agricultural plants*, Longman-Cheshire, Melbourne.

(ISBN: 0-582-86911-0)

Poelhman, JM & Sleper, DA 1995, *Breeding field crops*, 4th edn, Iowa State University Press, Ames.

(ISBN: 0-9139-2426-5)

Simmonds, NW & Smartt, J 1999, *Principles of crop improvement*, 2nd edn, Blackwell Science,

(ISBN: 0-632-04191-9)

Slafer, GA (ed) 1994, *Genetic improvement of field crops*, Dekker, New York.

(ISBN: 0-8247-8980-6)

Smartt, J & Simmonds, NW 1995, *Evolution of crop plants*, 2nd edn, Longman Scientific and Technical, Harlow, Essex.

Stalker, HT & Murphy, JP (eds) 1992, *Plant breeding in the 1990's*, CAB International, Wallingford, Eng.

(ISBN: 0-85193-717-6)

Stoskopf, NC, Tomes, DT & Christie, BR 1993, *Plant breeding: theory and practice*, Westview Press, Boulder.

(ISBN: 0-8133-1764-9)

## STUDENT WORKLOAD REQUIREMENTS

ACTIVITY	HOURS
Examinations	3.00
Lectures	24.00
Private Study	97.00
Residential Schools	30.00

## ASSESSMENT DETAILS

Description	Marks out of	Wtg (%)	Due date
PLANT BREEDING ESSAY	15.00	15.00	05 Sep 2008
PROBLEM SET 1	5.00	5.00	05 Sep 2008
1 HOUR MID SEMESTER TEST	25.00	25.00	25 Sep 2008 (see note 1)
PROBLEM SET 2	5.00	5.00	10 Oct 2008
2HR RESTRICTED EXAM	50.00	50.00	END S2 (see note 2)

### NOTES

1. A four day residential school will be held during the second week of the mid-semester break (9am-5pm from Tuesday 23rd September 2008 to Friday 26th September 2008 inclusive). A detailed list of activities during this residential is contained in the External Study Guide.
2. 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 assignments satisfactorily, students must obtain at least 50% of the marks available for each assignment. To complete the examination satisfactorily, students must obtain at least 50% of the marks available for the examination.
  - 3 Penalties for late submission of required work:  
If students submit assignments after the due date without (prior) approval of the examiner then a penalty of 5% of the total marks gained by the student for the assignment may apply for each working day late up to ten working days at which time a mark of zero may be recorded. No assignments will be accepted after model answers have been posted.
  - 4 Requirements for student to be awarded a passing grade in the course:  
To be assured of receiving a passing grade a student must achieve at least 50% of the total weighted marks available for the course.
  - 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 (or grades) obtained for each of the summative assessment items in the course.
  - 6 Examination information:  
In a Restricted Examination, candidates are allowed access to specific materials during the examination. The only materials that candidates may use in the restricted examination for this course are: writing materials (non-electronic and free from material which could give the student an unfair advantage in the examination); calculators which cannot hold textual information (students must indicate on their examination paper the make and model of any calculator(s) they use during the examination. Candidates may, take an appropriate non-electronic translation dictionary (but not technical dictionaries) into the examination. This will be subject to perusal and, if it is found to contain annotations or markings that could give the candidate an unfair advantage, it may be removed from the candidate's possession until the appropriate disciplinary action is completed.
  - 7 Examination period when Deferred/Supplementary examinations will be held:  
Any Deferred or Supplementary examinations for this course will be held in the fourth week of the semester following this course offering and the examiner will advise students involved in writing of the date time and location of any such examination.
  - 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 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. This must be produced within five days if required by the Examiner. In accordance with University's Assignment Extension Policy (Regulation 5.6.1), the examiner of a course may grant an extension of the due date of an assignment in extenuating circumstances.

10 Students who have undertaken all of the required assessments in a course but who have failed to meet some of the specified objectives of a course within the normally prescribed time may be awarded the temporary grade: IM (Incomplete - Make-up). An IM grade will only be awarded when, in the opinion of the examiner, a student will be able to achieve the remaining objectives of the course after a period of non directed personal study. Students who, for medical, family/personal, or employment-related reasons, are unable to complete an assignment or to sit for an examination at the scheduled time may apply to defer an assessment in a course. Such a request must be accompanied by appropriate supporting documentation. One of the following temporary grades may be awarded IDS (Incomplete - Deferred Examination); IDM (Incomplete Deferred Make-up); IDB(Incomplete - Both Deferred Examination and Deferred Make-up).