



The University of Southern Queensland

Course specification

Description: Plant Biochemistry and Biotechnology

Subject	Cat-nbr	Class	Term	Mode	Units	Campus
BIO	3302	54263	2, 2006	ONC	1.00	Toowoomba

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

STAFFING

Examiner: Mark Sutherland

Moderator: Grant Daggard

REQUISITES

Pre-requisite: BIO1101 and BIO2201

OTHER-REQUISITES

Recommended Pre-Requisite: BIO2103, BIO2202 and BIO2209

RATIONALE

The purpose of this course is to give students a theoretical overview of advanced topics in plant biochemistry and biotechnology with particular regard to the interactions of plants with their environment. In addition they will gain practical experience in techniques in plant biotechnology and an understanding of their ethical and legislative contexts.

SYNOPSIS

THIS COURSE IS OFFERED IN ODD-NUMBERED YEARS ONLY. Students will be introduced to areas of current research in plant biotechnology and biochemistry. Topics include: plant tissue culture; plant genetic engineering; secondary plant metabolites and their potential uses in biotechnology; environmental regulation of photosynthesis; and the effects of environmental stimuli on plant development. The importance of cell signalling mechanisms in response to environmental cues and the regulation of gene expression is emphasised. In the laboratory students gain practical experience in the application of tissue culture and gene transfer techniques to plant research.

OBJECTIVES

On completion of this course students will be able to:

1. demonstrate an understanding of the factors controlling the maintenance and differentiation of plant cells and tissues in sterile culture;

2. demonstrate an understanding of the major concepts concerned with plant genetic engineering, including social, ethical and legislative contexts;
3. demonstrate an understanding of the mechanisms and regulation of nutrient assimilation and photosynthetic processes in plants.
4. demonstrate an understanding of the effects of major environmental factors on plant growth and development and of the mechanisms which control plant responses and adaptations of these external factors;
5. demonstrate knowledge of, and experience in, current methodologies in plant biotechnology;
6. report scientific information and research results in a clear, concise and rigorous manner.
7. demonstrate enhanced skills in the oral and written presentation of scientific information and research results.

TOPICS

	Description	Weighting (%)
1.	Plant Tissue Culture: micropropagation, callus formation and differentiation, suspension cultures and protoplasts.	20.00
2.	Secondary Plant Metabolism: the ecological roles of secondary plant metabolites, overview of the major synthesis pathways, secondary plant products and biotechnology.	15.00
3.	Nutrient assimilation: mechanisms and regulation of nitrogen uptake.	10.00
4.	Plant Genetic Engineering - methodology, applications, social, ethical and regulatory issues.	15.00
5.	The regulation of photosynthetic processes in a hostile environment - review of light and dark reactions, environmental constraints, photorespiration, C4 and CAM plants, carbohydrate distribution from sources to sinks.	20.00
6.	Plant Developmental Responses - phytochromes, blue light receptors and photomorphogenesis, signal perception and transduction, senescence and programmed cell death.	20.00

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).

Taiz, L & Zeiger, E 2002, *Plant Physiology*, 3rd edn, Sinaur, Sunderland, Mass.

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.

, , *Trends in Plant Science*,

(Journal)

, , *Annual Reviews of Plant Physiology and Plant Molecular Biology*,

(Journal)

Buchanan, BB, Gruissem, W & Jones, RL 2000, *Biochemistry & Molecular Biology of Plants*, American Society of Plant Physiologists, Rockville, MD.

(ISBN 0 943088 37 2)

Chawla, HS 2003, *Plant Biotechnology: A Practical Approach*, Science Publishers, ISBN 1 57808 296 X.

Christou, P & Klee, H 2004, *Handbook of Plant Biotechnology*, John Wiley & sons, ISBN 0 471 85199 X.

Galindo, JCG, Macias, FA, Gonzalez Molinillo, JM & Cutler, HG 2003, *Allelopathy: Chemistry and Mode of Action of Allelochemicals*, CRC Press, ISBN 0 8493 1964 1.

Hall, DO & Rao, KK 1999, *Photosynthesis*, 6th edn, Cambridge University Press, Cambridge. (0 521644 97 6)

Hall, R 1999, *Plant Cell Culture Protocols*, Humana Press, Totowa.

(ISBN 0 89603 599 2)

Jackson, JF & Linskens, HF (eds) *Molecular Methods of Plant Analysis - Genetic Transformation of Plants*, Springer, ISBN 3 540 00292 8, Vol 23.

Kaufman, PB et al 1999, *Natural Products from Plants*, CRC Press, Boca Raton.

(ISBN 0 8493 3134 X)

Lawlor 2001, *Photosynthesis*, 3rd edn, Bios Scientific Publishers, Oxford.

(ISBN 1 8599 6157 6)

Lea, PJ & Leegood, RC 1999, *Plant Biochemistry and Molecular Biology*, 2nd edn, Wiley, Chichester.

(ISBN 0 471 97683 0)

Leegood, RC, Sharkey, TD & Von Caemmerer, S 2000, *Photosynthesis: Physiology and Metabolism*, Kluwer Academic Publishers,

(ISBN 0 7923 6143 1)

Lumsden, PJ & Millar, AJ 1998, *Biological Rhythms and Photoperiodism in Plants*, Bios Scientific, New York.

(ISBN 1 85996 2165)

Nguyen, HT & Blum, A (eds) 2004, *Physiology and Biotechnology Integration for Plant Breeding*, Marcel Dekker, ISBN 0 8247 4802 6.

Sage, RF & Monson, RK 1999, *C4 Plant Biology*, Academic Press, San Diego.

(0 12 228740 1)

Seigler, DS 1998, *Plant Secondary Metabolism*, Kluwer, Boston.

(ISBN 0 412 01981 7)

Slater, A, Scott, NW & Fowlers, MR 2003, *Plant Biotechnology*, Oxford University Press, (ISBN 0 19 925468 0)

Trigiano, RN & Gray, DJ 2000, *Plant Tissue Culture Concepts and Laboratory Exercises*, 2nd edn, CRC Press, Boca Raton.

(0 8493 2029 1)

Trigiano, RN & Gray, DJ 2004, *Plant Development and Biotechnology*, CRC Press, ISBN 0 8493 1614 6.

STUDENT WORKLOAD REQUIREMENTS

ACTIVITY	HOURS
Examinations	3.00
Laboratory or Practical Classes	39.00
Lectures	26.00
Private Study	55.00
Report Writing	45.00

ASSESSMENT DETAILS

Description	Marks out of	Wtg(%)	Due date
PRACTICAL REPORTS	25.00	25.00	19 Jul 2005 (see note 1)
ESSAY	25.00	25.00	19 Jul 2005 (see note 2)
3 HR RESTRICTED EXAM	50.00	50.00	END S2 (see note 3)

NOTES

1. Examiner to advise due dates for practical reports
2. Examiner to advise due date of Essay
3. 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.
- 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 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. With the Examiner's approval, 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 Semester 3 examination period following the offering of the course.
- 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.