

<b>FACULTY OF BIOSCIENCES AND BIOENGINEERING</b>	Page :
<b>COURSE: SQG 4253 APPLICATIONS OF TISSUE CULTURE</b>	Revision : <b>1</b>
	Date of issue : <b>December 2008</b>
	Last Amendment : <b>3 July 2007</b>
	Edition : <b>1</b>
	Procedure No : <b>FBB/UG/SQG 4253</b>
<b>PRE-REQUISITE</b>	NONE
<b>EQUIVALENCE</b>	NONE
<b>CREDIT HOURS</b>	3 Credits

	<b>Lecturers</b>	<b>E-Mail</b>	<b>Room No.</b>	<b>Phone No.</b>
1.	Dr. Azman Abd Samad	azman@fbb.utm.my	C10-410	34344
2.	Dr. Razauden Mohamed Zulkifli	razauden@fbb.utm.my	C19-423	34507

### SYNOPSIS

This course elaborates the principles and application of plant and animal cell and tissue culture. The potential and the usage of tissue culture in biotechnology, research and industry involve transformation techniques, in vitro breeding, genetic engineering and germplasm conservation. The course will also provide knowledge in protoplast fusion, embryo rescue, haploid, and somaclonal variation. Upon completion, students should be able to explain some useful techniques in improving the quality of animal and plant including their health and development.

### COURSE LEARNING OUTCOMES

By the end of the course, students should be able to :

<b>No.</b>	<b>Course Learning Outcomes</b>	<b>Programme Learning Outcome(s) Addressed</b>	<b>Assessment Methods</b>
1.	Give examples of transgenic plant and transgenic animal and their applications in agrobiotechnology in particular.	PLO1(C2), PLO2(C2)	T, Q
2.	Illustrate steps involved in production of transgenic organism sequentially.	PLO1(C3), PLO2(C3)	F <sub>(t)</sub>
3.	Compare and contrast methods of gene transfer in plant and animal cells on the whole.	PLO1(C4), PLO2(C4, P2, A2), PLO3 (C4)	T, F <sub>(t)</sub>
4.	Work in a team to point up safety issues on genetically modified organisms in general.	PLO6(LS1) PLO3(C3, P4, A2)	A, Pr, R
5.	Communicate effectively in presentation session.	PLO4 (CS1, CS2)	Pr, R
6.	Demonstrate acceptable skills in mammalian and plant tissue culture technique.	PLO3(C3), PLO2(C3, P4, A2)	LR, F <sub>(p)</sub>

Note :T – Test ; PR – Project ; Q – Quiz; HW – Homework ; Pr – Presentation; F<sub>(t)</sub> – Final Exam (Theory); F<sub>(p)</sub>- Final Exam (Practical); A – Assignment; LR-Laboratory Report; R-Rubric

<b>PREPARED BY :</b>	<b>CERTIFIED BY :</b>
<b>Name</b> : Dr. Azman Abd Samad & Dr. Razauden Mohd Zulkifli  <b>Signature</b> :  <b>Date</b> : December 2008	<b>Name</b> :  <b>Signature</b> :  <b>Date</b> :

<b>FACULTY OF BIOSCIENCES AND BIOENGINEERING</b>	Page :
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**STUDENT LEARNING TIME**

<b>Teaching and Learning Activities</b>	<b>Student Learning Time (hours)</b>
1.Face to Face Learning	
a.Lecturer-Centered Learning	
i. Lecture	42
b.Student-Centered Learning (SCL)	
1. Practical/Tutorial	12
2. Student-centered learning activities	8
2.Self-Directed Learning	
1. <i>Non-face-to-face learning</i> or student-centered learning (SCL) such as manual, assignment, module, e-Learning, etc.	16
b.Revision	20
2. Assessment Preparations	13
3.Formal Assessment	
a.Ongoing Assessment (Test + Assignment + lab report + Presentation)	5
b.Final Exam	4
<b>Total (SLT)</b>	<b>120</b>

**TEACHING METHODOLOGY**

- Lectures shall emphasize on theories, followed by worked examples during practical session and further applications to problems of interest in plant and animal cell culture.

<b>FACULTY OF BIOSCIENCES AND BIOENGINEERING</b>	Page :
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**WEEKLY SCHEDULE**

<b>Week</b>	<b>Lecture</b>	<b>Topic / Content</b>
1	1 - 3	<b>Introduction</b> 3. Protoplast isolation and culture
2	4 - 6	<b>Somatic Hybridization and Cybridization</b> 4. protoplast fusion 5. selection of fusion products 6. verification of hybridity 7. genetic consequences of protoplast fusion
3	7 - 9	<b>Genetic Engineering</b> 8. Methods of gene transfer 9. <i>Agrobacterium tumefaciens</i> mediated transformation 10. Crown gall disease 11. Ti plasmid genetic structure 12. Plant wound signals and the control of vir gene expression 13. <b>Molecular mechanism of T-DNA transfer</b>
4	10 - 12	<b>Ti plasmid as a vector for plant transformation</b> 14. Plant transformation 15. A binary vector system 16. Plant transformation: manipulation of plant cells and explants 17. optimization of gene expression in transgenic plants 18. The use of transgenic plants to study plant genes 19. Co-suppression
5	13 - 15	<b>Production of disease-free plants</b> 20. Heat treatment and meristem culture 21. virus-free plants produced from callus and protoplasts 22. production of bacteria and fungal-free plants of meristem culture <b>23. TEST 1</b>
6	16 - 18	<b>Production of secondary metabolites</b> Commercial aspects
7	19 - 21	<b>Genetically modified crops:</b> Their development, uses, and risks
<b>8</b>	<b>MID SEMESTER BREAK</b>	
9	22 - 24	<b>Introduction to animal cell culture</b>
10	25 - 27	<b>Gene transfer methods in animals</b> 24. microinjection 25. liposomal cationic 26. Non liposomal kationic 27. electroporation 28. retrovirus and gene transfer

<b>FACULTY OF BIOSCIENCES AND BIOENGINEERING</b>	Page :	
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Week	Lecture	Topic / Content
11	28 - 30	<b>Transgenic animal and their application</b> 29. animal models to study human diseases; cancer 30. medical application
12	31 - 33	<b>Transgenic animal and their application</b> 31. Improving livestock 32. Molecular pharming
13	34 - 36	<b>Animal propagation</b> 33. artificial insemination 34. animal clones (TEST 2)
14	37 - 39	<b>Conservation biology</b> 35. embryo transfer <b>36. Assignment</b>
15	40 - 42	<b>Tissue engineering</b> 37. medical application 38. bioartificial organ <b>Presentation</b>
16-18	<b>REVISION WEEK AND FINAL EXAMINATION</b>	

#### **WEEKLY SCHEDULE (LABORATORY PRACTICAL)**

Week	Practical No	Topic / Content
2	-	Briefing Session
3	1	Protoplast isolation
5	2	<i>Agrobacterium tumefaciens</i> -mediated transformation
<b>8</b>	<b>MID SEMESTER BREAK</b>	
9	3	Introduction to cell culture techniques
11	4	Transfection of mammalian cells
16-18	<b>REVISION WEEK AND FINAL EXAMINATION</b>	

#### **REFERENCES**

1	Liang, GH and Skinner, DZ (2004) Genetically Modified Crops: Their development, uses, and risks. The Haworth Press, New York
2	Halford, N (2006) Plant Biotechnology: Current and future applications of genetically modified crops. John Wiley & Sons, Ltd, Chicester, England
3	Barnum, SR (2005) Biotechnology : An Introduction. Thomson Books/Cole, USA
4	Razdan, M.K. (2003). Introduction to plant tissue culture. 2 <sup>nd</sup> Eds. New Delhi: Oxford Co. Pvt. Ltd
5	

<b>FACULTY OF BIOSCIENCES AND BIOENGINEERING</b>	Page :
<b>COURSE: SQG 4253 APPLICATIONS OF TISSUE CULTURE</b>	Revision : <b>1</b>
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### **GRADING**

<b>No.</b>	<b>Assessment</b>	<b>Number</b>	<b>% each</b>	<b>% total</b>	<b>Dates/Weeks</b>
1.	Assignment	1	10	10	14
2.	Laboratory Reports	4	5	20	2,5,9,11
3.	Presentation	1	10	10	15
4.	Test	2	10	20	5 & 13
5.	Final Exam (Theory)	1	30	30	16 - 18
6.	Final Exam (Practical)	1	10	10	15
<b>Overall Total</b>				<b>100</b>	

### **ATTENDANCE**

The student should adhere to the rules of attendance as stated in the University Academic Regulation :-

Students must attend not less than 80% of lecture hours as required for the course.

The student is prohibited from attending any lecture and assessment activities upon failure to comply the above requirement. Zero mark will be given for the course.