

DETAILED SUBJECT OUTLINE

- 1. Subject title:** **BIOTECHNOLOGY IN AGRICULTURE:
APPLICATIONS AND ETHICAL ISSUES**
 - **Code:** **HR486C**
 - **Credits:** 3
 - **Work-load:** 45 class hours + 90 self-study hours

- 2. Responsible unit:** Department of Molecular Biotechnology
Institute of Biotechnology Research and Development

- 3. Prerequisites:** None

- 4. Subject objectives:** This subject aims at providing students fundamental information about biotechnology and giving them a chance to discuss the advantages/opportunities and disadvantages/risks as well as different social, economical and ethical issues associated with its applications in agriculture; thus each student could establish his/her own wise view and decision on how to use biotechnology to meet the contemporary agricultural demands of the world based on the current international and national policies. After completion of the subject, the students should meet the following criteria:
 - 4.1. Knowledge:** The students will obtain/gain knowledge about
 - 4.1.1. The definition and development through time of biotechnology;
 - 4.1.2. Recombinant DNA technology and other bio-technologies;
 - 4.1.3. The roles of biotechnology in the contemporary world; and
 - 4.1.4. Different issues/debates about biotechnology applications in agriculture.

 - 4.2. Skills:** The students could be able to
 - 4.2.1. Perceive, analyze and discuss different topics on biotechnology and the social, economical and ethical issues associated with its applications in agriculture;
 - 4.2.2. Further develop/enhance their knowledge and technical English in biotechnology;
 - 4.2.3. Establish their own wise view and decisions on how to use biotechnology to meet the contemporary agricultural demands of the world based on the current international and national policies;
 - 4.2.4. Disseminate transparently knowledge about biotechnology and the advantages/opportunities and disadvantages/risks associated with its applications in agriculture; and
 - 4.2.5. Work in teams to solve biotechnological problems in agriculture.

4.3. Attitude: The students are expected to

- 4.3.1. Be self-discipline and responsible;
- 4.3.2. Be true and transparent;
- 4.3.3. Love their community especially low-income people; and
- 4.3.4. Be active in knowledge dissemination in biotechnology and the advantages/opportunities and disadvantages/risks associated with its applications in agriculture.

5. Subject description: This subject provides students fundamental information about biotechnology, from definition to the development through time and the techniques used to develop biotechnological products. The potentials and current applications of biotechnology in agriculture are then discussed in connection with public perception and different social, economical and ethical issues of this technology. A number of selective topics would be presented by the students where they would have a chance to discuss the advantages/opportunities and disadvantages/risks of biotechnology and its applications in agriculture. Each student is expected to be able to establish his/her own wise view and decision on how to use biotechnology to meet the contemporary agricultural demands of the world based on the current international and national policies.

6. Subject content:

	Class hours	Objectives
Lectures	33	4.1; 4.2.1; 4.2.2; 4.3.1; 4.3.2; 4.3.3
Orientation meeting	1	4.3.1; 4.3.2; 4.3.3
Lecture 1. Introduction to biotechnology	2	4.1.1
Lecture 2. The molecular biotechnology revolution	3	4.1.1
Lecture 3. Techniques used to develop biotechnology products 3.1. DNA amplification and sequencing 3.2. Recombinant DNA technology 3.3. Protein-enzyme technology 3.4. Cell biotechnology	12	4.1.2
Lecture 4. Biotechnology in agriculture - Potentials and applications 4.1. Plant biotechnology 4.2. Animal biotechnology 4.3. Microbial biotechnology	9	4.1.3

Lecture 5. Biotechnology and society 5.1. Public perception of biotechnology 5.2. Social issues 5.3. Economical issues 5.4. Ethical issues	6	4.1.3; 4.1.4
Students' presentations <i>The following topics are subject to change based on students' background and expectations.</i>	9	4.1; 4.2; 4.3
Topic 1. Applications of gene technology in agriculture	1	4.1.2; 4.1.3; 4.2.3
Topic 2. Applications of protein-enzyme technology in agriculture	1	4.1.2; 4.1.3; 4.2.3
Topic 3. Applications of animal cell biotechnology	1	4.1.2; 4.1.3; 4.2.3
Topic 4. Commercial genetically modified (GM) crops	1	4.1.2; 4.1.3; 4.2.3
Topic 5. Genetically modified (GM) animals - Current status and perspectives	1	4.1.2; 4.1.3; 4.1.4; 4.2.3
Topic 6. Applications of microbial biotechnology in agriculture	1	4.1.2; 4.1.3; 4.2.3
Topic 7. Biotechnological solutions for environmental problems	1	4.1.2; 4.1.3; 4.2.3
Topic 8. GMO products - Social and economical issues	1	4.1.2; 4.1.3; 4.1.4; 4.2.3
Topic 9. GMOs in Vietnam - Current status and perspectives	1	4.1.2; 4.1.3; 4.1.4; 4.2.3
Subject review, Q&A, feedbacks/comments	1	4.1; 4.3.1; 4.3.2
Final examination	2	4

7. Teaching methodology: Student-centered approach

- Synchronize subject requirements with the general background and expectations of students;
- Provide key information, raise questions, lead discussion of the students, summarize and provide take-home messages; and

- Give the students group assignments where they should prepare, present and discuss different selective topics on the applications as well as the social, economical and ethical issues of biotechnology in agriculture.

8. Students' responsibilities:

- Attend $\geq 36/45$ scheduled class hours;
- Raise questions and provide feedbacks/comments (if any);
- Be self-discipline and responsible;
- Fulfill group assignments (presentation); and
- Take the final examination.

9. Assessment:

9.1. Grade components:

No.	Grade components	Requirements	Weight	Objectives
1	Presentation	Each group of 4-5 students has to deliver a well-prepared, informative, comprehensive and interesting oral presentation on a selective biotechnology topic. Fruitful discussion is expected during the presentation.	50%	4.1; 4.2; 4.3
2	Final examination	Each student has to complete a written examination with correct and concise answers. Creative solutions/ideas are encouraged.	50%	4

9.2. Grading system: Final grade is calculated as a sum of the 2 grade components (presentation 50% and final examination 50%). This is given from 0 to 10 rounded to one decimal place. The final grade will then be transformed into the "A-B-C-D" grading system, which corresponds to the grades of 4 to 0 provided by the grading policies of Can Tho University.

10. References:

	Location
[1] Glick B. R. and Pasternak J. J. 2003. Molecular Biotechnology - Principles and Applications of Recombinant DNA (3 rd edition). ASM Press, USA. 760 pages.	Molecular Biology Laboratory, Institute of Biotechnology R&D, Can Tho University
[2] Ratledge C. and Kristiansen B. 2006. Basic Biotechnology (3 rd edition). Cambridge University Press, UK. 666 pages.	
[3] Avise J. C. 2004. The Hope, Hype & Reality of	

Genetic Engineering. Oxford University Press, Inc., USA. 242 pages.	
[4] Comstock G. L. 2000. Vexing Nature? On the Ethical Case Against Agricultural Biotechnology. Kluwer Academic Publishers, USA. 297 pages.	
[5] Phạm Thành Hồ. 2006. Introductory Biotechnology (Nhập môn Công nghệ Sinh học). Vietnam Education Publishing House (Nhà xuất bản Giáo dục), Vietnam. 311 pages.	
[6] Website of the Vietnam Government (Cổng thông tin điện tử Chính phủ Nước CHXHCN Việt Nam).	http://vanban.chinhphu.vn/portal/page/portal/chinhphu/hethongvanban

11. Self-study guide:

Week	Content	Hours	Students' activities
1	Orientation meeting Lecture 1: Introduction to biotechnology	6	Look for the recommended references, read chapter 1 of book [5] and search for relevant information in book [3].
2	Lecture 2: The molecular biotechnology revolution	6	Read 1 in chapter I of book [1] and chapter 1 of book [5] and search for relevant information in book [3].
3	Lecture 3: Techniques used to develop biotechnology products 3.1. DNA amplification and sequencing	6	Read 5 in chapter I of book [1] and chapter 3 of book [5].
4	Lecture 3: Techniques used to develop biotechnology products (<i>continued</i>) 3.2. Recombinant DNA technology	6	Read 4 in chapter I of book [1], chapters 4 and 5 of book [2] and chapter 3 of book [5].
5	Lecture 3: Techniques used to develop biotechnology products (<i>continued</i>) 3.3. Protein-enzyme technology	6	Read 7 and 8 in chapter I and 16 in chapter II of book [1], chapters 14, 20 and 21 of book [2] and chapter 5 of book [5].
6	Lecture 3: Techniques used to develop biotechnology products (<i>continued</i>) 3.4. Cell biotechnology	6	Read 19 and 20 in chapter III of book [1], chapters 22 and 23 of book [2] and chapter 2 of book [5].

7	Lecture 4: Biotechnology in agriculture - Potentials and applications 4.1. Plant biotechnology	6	Read 17 and 18 in chapter III of book [1], chapters 4 and 6 of book [3] and chapters 4, 9 and 11 of book [5] and search for relevant information in book [4].
8	Lecture 4: Biotechnology in agriculture - Potentials and applications (<i>continued</i>) 4.2. Animal biotechnology	6	Read 19 and 20 in chapter III of book [1], chapters 5 and 6 of book [3] and chapters 4 and 10 of book [5] and search for relevant information in book [4].
9	Lecture 4: Biotechnology in agriculture - Potentials and applications (<i>continued</i>) 4.3. Microbial biotechnology	6	Read chapter II of book [1], chapters 16 and 17 of book [2], chapters 3 and 6 of book [3] and chapters 4, 6, 7, 8 and 11 of book [5].
10	Lecture 5: Biotechnology and society 5.1. Public perception of biotechnology 5.2. Social issues	6	Read chapter IV of book [1], chapters 1 and 13 of book [2] and chapter 12 of book [5] and search for relevant information in books [3] and [4] and website [6].
11	Lecture 5: Biotechnology and society (<i>continued</i>) 5.3. Economical issues 5.4. Ethical issues	6	Read chapter IV of book [1], chapter 13 of book [2] and chapter 12 of book [5] and search for relevant information in books [3] and [4] and website [6].
12	Topic 1: Applications of gene technology in agriculture Topic 2: Applications of protein-enzyme technology in agriculture Topic 3: Applications of animal cell biotechnology	6	Collect references and compose the presentation.
13	Topic 4: Commercial genetically modified (GM) crops Topic 5: Genetically modified (GM) animals - Current status and perspectives Topic 6: Applications of microbial biotechnology in agriculture	6	Collect references and compose the presentation.
14	Topic 7: Biotechnological solutions for environmental problems	6	Collect references and compose the presentation.

	Topic 8: GMO products - Social and economical issues Topic 9: GMOs in Vietnam - Current status and perspectives		
15	Subject review, Q&A, feedbacks/comments Final examination	6	Review all the lectures, presented topics and class discussion.

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DIRECTOR**

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