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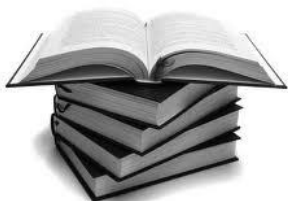
2016

# **School of Biotechnology**

STUDENT HANDBOOK

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# WELCOME LETTER

Dear BT students,

Congratulations on the great achievement you have made to date. We hope you can maintain this momentum to successfully complete your studies at the School of Biotechnology or BT. Some humorously said that “BT” stands for “*bình thường*” or “*normal*”. Our response is “in biology normal means functioning in a natural way”. Our school has been *naturally* blessed with both dedicated staff and talented students, growing resources and increasing opportunities. As a result, many of us have been *naturally* successful either in studying or teaching, doing research.

Your presence today and future contribution is expected to lift up the school’s prestige since biotechnology, food technology, biochemistry and aquatic resource management are all considered essential globally. We wish you all the best for your study. Enjoy your time here and don’t forget that we are always around to help you fulfill your studies.

On the behalf of BT

**Associate Professor Hoang Tung**

Dean, School of Biotechnology

# AT THE FIRST GLANCE

## 1. International University-Vietnam National University, HCMC

The **International University** (IU) a member of **Vietnam National University** in Ho Chi Minh City, is the first public university that uses English for teaching and adopts international education standards. Our curricula and education quality are recognized by top universities in the US, UK, and Australia.

The IU is currently striving to become a prestigious research institution and training high quality human resources for the country. It is fully empowered to award all degrees from undergraduate to post graduate levels. Its internationality is reflected in international academic environment of IU as a whole, including all degree programs, teaching staff, languages of instruction, academic and research infrastructure. Its publicity is reflected in the long – term support from the government and other funding agencies and organizations at all levels – from local national to regional and international.

## 2. School of Biotechnology

The School of Biotechnology is a part of International University which offers fully English Biotechnology courses for Bachelor, Master and Doctor's degrees

The School of Biotechnology has 4 Departments: Biotechnology, Food Technology, Applied Chemistry, and Aqua Science.

About Laboratory: BT currently has 14 laboratories

### ❖ Educational Objective

Consistent with the stated *mission* of the University, the mission of School of Biotechnology is to prepare its graduate for a rapidly changing technological field.

The *objective* of School of Biotechnology is to educate students with complete basic knowledge and skills in electronic and communication areas and for the needs of industries as well as academia.

Besides, we encourage and nurture students' interest in doing research and link students with industries in order meet the challenges of this area.

### ❖ Academic Program

School of Biotechnology offers two types of training programs:

- **The training program at International University (4 years)**

The 4-year undergraduate program in Biotechnology is educated at International University. On completion of this course, students are awarded the degree of Bachelor of Engineering in Biotechnology by Vietnam National University, HCMC.

- **The twinning program between the International University and a foreign partner university (2+2 program)**

These programs allow students to spend the first two years studying at the International University and the other two years at the partner universities. After completing the second phase and meeting all requirements from the partner universities, students will be awarded the Bachelor Degree by the partner universities.

Currently, School of Biotechnology has following twinning programs:

- The twinning program with University of Nottingham, England. (since 2005)
- The twinning program with University of the West of England (since 2007)

#### ❖ **Learning Outcomes**

Graduates from school of Biotechnology should have attained:

- a. An ability to apply knowledge of mathematics and science;
- b. An ability to design and conduct experiments, as well as to analyse and interpret data;
- c. An ability to have a sense of chemical, biochemical analysis, synthetic approach to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability and sustainability;
- d. An ability to function on multi-disciplinary teams;
- e. An ability to identify, formulate and solve problems in Biotechnology;
- f. An understanding of professional and ethical responsibility;
- g. An ability to communicate effectively
- h. The broad education necessary to understand the impact of biotechnological solutions in a global, economic, environmental and societal context;
- i. A recognition of the need for, and an ability to engage in life-long learning;
- j. A knowledge of contemporary issues;
- k. An ability to use the techniques, skills, and modern technological tools necessary for biotechnological practice;
- l. A knowledge of probability and statistics, including applications appropriate to the Biotechnology program and objectives; and knowledge of mathematics through calculus, basic sciences, Bio-statistics and analytical approach necessary to analyse and design experimental tools and analysis;
- m. A knowledge of bioinformatics, typically including advanced biology, biochemistry and computer Bio- simulation.

## FACULTIES AND SUPPORT STAFF

Management Board	
Assoc. Prof Hoang Tung	Dean
Dr. Dang Quoc Tuan	Vice Dean
Assoc.Prof Tran Van Minh	Head, Department of Biotechnology
Dr. Nguyen Minh Thanh	Head, Department of AquaScience
Assoc. Prof Pham Van Hung	Head, Department of Food Technology
Dr. Hoang Le Son	Head, Department of Applied Chemistry
MAppSc. Bui Xuan Anh Dao	Dean's Assistant for Student Affairs
MSc. Do Ngoc Phuc Chau	Dean's Assistant for Research and Postgraduate education
MSc. Dang Thi Lan Anh	Lab Manager
Support Staff	
Ms. Mai Thi Thanh Loan	Academic Officer
Ms. Huynh Hong Hoang Hanh	Academic Officer
Ms. Ly Ngoc Doan Trang	Academic Officer

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# FACILITIES FOR LEARNING AND RESEARCH

- System of libraries and international standard auditoria
- Laboratory system:
  - Food Engineering
  - Pharmaceutical Chemistry
  - Applied Biochemistry
  - Food Processing
  - Food Microbiology and Food Safety
  - Cell Biotechnology
  - Biomedicine and Molecular Biotechnology
  - Plant Biotechnology
  - Cell Reprogramming
  - Computational Biology
  - Marine Biotechnology
  - Applied Hydrobiology
  - Central Lab
  - Laboratory of Algal Technology

## PROGRAMS OFFERED AT IU

Undergraduate Programs	
Bachelor of Science in Biotechnology	4 years
Bachelor of Science in Aquatic Resource Management	4 years
Bachelor of Engineering in Food Technology	4 years
Bachelor of Science in Biochemistry	4 years
Postgraduate Programs	
Master of Science in Biotechnology ( <i>by Research</i> )	2 years
Doctor of Philosophy in Biotechnology	3 to 5 years

## TWINNING PROGRAMS

University of Nottingham, England	
Transfer conditions	<p>Finish the first 2 years at International University, Vietnam National University, HCM with accumulated GPA no less than 60</p> <p>Acquire an IELTS score from 6.0 (for both campuses in Malaysia and UK)</p>
Tuition and Living Cost	<p>First stage at International University: around \$2,500 – \$3,000 per year</p> <p>Second stage at:</p> <ul style="list-style-type: none"> <li>- University of Nottingham, UK campus: around 10,000 – 14,000 GBP per year</li> <li>- Living cost in UK: around 8,400 GBP per year</li> </ul> <p>OR</p> <ul style="list-style-type: none"> <li>- University of Nottingham, Malaysia campus: around \$10,000 per year</li> <li>- Living cost in Malaysia: around \$4,000 per year</li> </ul>
University of the West of England, England	
Transfer conditions	<p>Finish the first 2 years at International University, Vietnam National University, HCM</p> <p>Acquire an IELTS score from 6.0 (with constituent scores no less than 5.5)</p>
Tuition and Living Cost	<p>First stage at International University: around \$2,500 – \$3000 per year</p> <p>Second stage at University of West England, UK: around 9,000 GBP per year</p> <p>Living cost in UK: around 8,400 GBP per year</p>

# CURRICULUM

## UNDERGRADUATE

### A. BIOTECHNOLOGY

*IU program*

*Twinning program*

1. UN Twinning program
2. UWE Twinning program

### B. AQUATIC RESOURCE MANAGEMENT

### C. FOOD TECHNOLOGY

### D. BIOCHEMISTRY

## POSTGRADUATE

### MASTER OF SCIENCE IN BIOTECHNOLOGY

### DOCTOR OF PHILOSOPHY IN BIOTECHNOLOGY

# UNDERGRADUATE

## A.BIOTECHNOLOGY

### IU PROGRAM

The curriculum is designed based on students' English level as the followings:

- English level 1(*Standard*): TOEFL  $\geq 500$  (equivalent TOEFL IBT 60)
- English from level 2:  $430 \leq \text{TOEFL} < 500$  (student need to complete Intensive English 2 course first)
- English from level 3: TOEFL  $< 430$  (student need to complete Intensive English 1 and Intensive English 2 course first)

#### English level 1 (*Standard*) – Total credits accumulation: 134 (including political courses)

Semester 1			Semester 2		
MA001IU	Calculus 1	4	MA002IU	Calculus 2	4
PH013IU	Physics 1	2	PH014IU	Physics 2	2
BT155IU	Biology	3,1	PE008IU	Critical Thinking	3
CH011IU	Chemistry for Engineers	3	BT150IU	Introduction to Biotechnology	2
CH012IU	Chemistry Laboratory	0,1	CH009IU	Organic Chemistry	3
EN007IU EN008IU	AE1	4	EN011IU EN012IU	AE2	4
PT001IU	Physical Training 1	3	PT002IU	Physical Training 2	3
Summer Semester					
PE012IU	Ho Chi Minh's Thoughts	3,0	PE014IU	Environmental Science	3,0
Semester 3			Semester 4		
BT162IU	Genetics	3,1	BT152IU	Biostatistics	2,1
BT010IU	Plant Physiology	3	BT156IU	Biochemistry	3,1
CH013IU	Analytical Chemistry	3,1	BT164IU	Microbiology	3,1
PE011IU	Principles of Marxism	5	BT220IU	Cell Biology	3

			BT163IU	Human and Animal Physiology	3
<b>Semester 5</b>			<b>Semester 6</b>		
PE013IU	Revolutionary Lines of Vietnamese Communist Party	2	BT217IU	Molecular Genetics	3
BT168IU	Molecular Biotechnology	3,1	BT203IU	Bioinformatics	3,1
BT205IU	Immunology	3,1		<i>Foundation elective</i>	3
	<i>Foundation elective</i>	6		<i>Free Electives</i>	3
<b>Summer Semester</b>					
BT200IU	Internship	0,2			
<b>Semester 7</b>			<b>Semester 8</b>		
BT216IU	Experimental Design	3	BT179IU	Thesis	12
	<b><i>Professional Elective</i></b>	<b>12</b>			

#### Free Elective (min 3 credits)

No	Subject	C
IS050IU	Project Management	3
BA115IU	Introduction to Business Administration	3
BA006IU	Business Communications	3

#### Foundation Elective (min 9 credits)

BT218IU	Plant Science	3
BT220IU	Marine Biology	3
BT200IU	Scientific Writing Workshop	2
BT207IU	Human Pharmacology	3
BT172IU	Protein Biotechnology	3,1
BT305IU	Pharmacology genomics	3

#### Professional Elective (min 12 credits)

BT211IU	Medical Genetics	3,1
BT214IU	Crop Biotechnology	3,1
BT201IU	Techniques in Plant Biotechnology	3,1
BT215IU	Algal Biotechnology	3,1
BT177IU	Marine Biotechnology	3,1
BT208IU	Environmental Biotechnology	3,1
BT185IU	Pharmaceutical Biotechnology	3,1
BT184IU	Molecular Diagnostics	3,1
BT174IU	Animal Biotechnology	3,1
BT212IU	Stem Cell Biology	3,1
BT213IU	Medical Microbiology	3,1

# TWINNING PROGRAM

## 1. UNIVERSITY OF NOTTINGHAM

The curriculum is designed based on students' English level as the followings:

- English level 1 (*Standard*): TOEFL  $\geq$  500 (equivalent TOEFL IBT 60)
- English from level 2:  $430 \leq \text{TOEFL} < 500$  (student need to complete Intensive English 2 course first)
- English from level 3: TOEFL  $< 430$  (student need to complete Intensive English 1 and Intensive English 2 course first)

English level 1 (standard)					
Semester 1			Semester 2		
MA001UN	Calculus 1	4	MA002UN	Calculus 2	4
PH013UN	Physics 1	2, 0	CH009UN	Organic Chemistry	3
PH014UN	Physics 2	2, 0	BT216UN	Experimental Design	3
BT155UN	Biology	3, 1	PE008UN	Critical Thinking	3
EN007UN, EN008UN	AE1	4	BT150UN	Introduction to Biotechnology	2
			EN011UN, EN012UN	AE2	4
Semester 3			Semester 4		
BT156UN	Biochemistry	3, 1	BT163UN	Human and Animal Physiology	3
BA006UN	Business Communication	3	BT164UN	Microbiology	3, 1
BT010UN	Plant Physiology	3	BT220UN	Cell Biology	3
BT162UN	Genetics	3, 1	PE014UN	Environmental Science	3
CH013UN	Analytical Chemistry	3, 1	BT152UN	Biostatistics	2,1
BT205UN	Immunology	3, 1	Choose 1 of these 2		
			BT201UN	Techniques in Plant Biotechnology	3, 1
			FT205UN	Nutrition and Functional Food	3



## 2. UWE PROGRAM

The curriculum is designed based on students' English level as the followings:

- English level 1 (*Standard*): TOEFL  $\geq 500$  (equivalent TOEFL IBT 60)
- English from level 2:  $430 \leq \text{TOEFL} < 500$  (student need to complete Intensive English 2 course first)
- English from level 3: TOEFL  $< 430$  (student need to complete Intensive English 1 and Intensive English 2 course first)

English level 1 (standard)					
Semester 1			Semester 2		
MA001WE	Calculus 1	4	MA002WE	Calculus 2	4
PH013WE	Physics 1	2	CH009WE	Organic Chemistry	3
PH014WE	Physics 2	2	BA006WE	Business Communication	3
BT155WE	Biology	3, 1	PE008WE	Critical thinking	3
PE014WE	Environmental Science	3	BT150WE	Introduction to Biotechnology	2
EN007WE EN008WE	AE1	4		AE2	4
Semester 3			Semester 4		
BT152WE	Biostatistics	3	BT220WE	Cell Biology	3
BT010WE	Plant Physiology	3	BT163WE	Human and Animal Physiology	3
BT162WEU	Genetics	3, 1	BT164WE	Microbiology	3, 1
CH013WE	Analytical Chemistry	3, 1	BT205WE	Immunology	3, 1
BT216WE	Experimental Design	3	BT156WE	Biochemistry	3, 1

## B. AQUATIC RESOURCE MANAGEMENT

The curriculum is designed based on students' English level as the followings:

- English level 1 (*Standard*): TOEFL  $\geq 500$  (equivalent TOEFL IBT 60)
- English from level 2:  $430 \leq \text{TOEFL} < 500$  (student need to complete Intensive English 2 course first)
- English from level 3: TOEFL  $< 430$  (student need to complete Intensive English 1 and Intensive English 2 course first)

English level 1 (standard) – Total credits accumulation: 138 (including political courses)					
Semester 1			Semester 2		
MA001IU	Calculus 1	4	MA019IU	Calculus 2	4
PH013IU	Physics 1	2	PH014IU	Physics 2	2
BT155IU	Biology	3, 1	BTAR101IU	Aquatic Ecology	3
CH011IU	Chemistry for Engineers	3	BTAR102IU	Introduction to Aquatic Resource Management	3
CH012IU	Chemistry Laboratory	0,1	PE014IU	Environmental Science	3
EN007IU EN008IU	AE1	4	EN011IU EN012IU	AE2	4
PT001IU	Physical Training 1	3	PT002IU	Physical Training 2	3
Summer Semester					
PE011IU	Principles of Marxism	5	PE008IU	Critical Thinking	3
Semester 3			Semester 4		
BT162IU	Genetics	3, 1	AR202IU	Global Climate Changes	3
BT156IU	Biochemistry	3, 1	AR203IU	Laboratory Methods	1, 2
AR201IU	Aquatic Microbiology	3, 1	PE013IU	Revolutionary Lines of Vietnamese Communist Party	2
PE012IU	Ho Chi Minh's Thoughts	3		<b>Elective courses 1</b>	4
BT152IU	Biostatistics	2, 1	AR205IU	Fish Physiology	3, 1
Summer Semester					
AR204IU	Field Course	0, 1			

Semester 5			Semester 6		
AR301IU	Hatchery Technology	3, 1	BT216IU	Experimental Design	3, 0
AR302IU	Aquaculture Genetics and Selective Breeding	3, 1	AR303IU	Monitoring of Aquatic Environment and Resources	3, 0
ISI050IU	Project Management	3	AR304IU	Fisheries Management	2, 1
	<b>Elective courses 1</b>	6	AR311IU	Environmental Impact Assessment	2, 1
				<b>Elective courses 2</b>	3
Summer Semester					
BT312IU	Internship	0, 2			
Semester 7			Semester 8		
	<b>Elective courses 2</b>	12	BT179IU	<b>Thesis</b>	12

#### Elective courses 1 (min. 10 credits)

1. BT220IU Marine Biology (2)
2. BT168IU Molecular Biotechnology (3,1)
3. BT205IU Immunology (3,1)
4. BT200IU Scientific Writing Workshop (2)
5. BA006IU Business Communication (3)
6. BA115IU Introduction to Business Administration (3)

#### Elective courses 2 (min. 15 credits)

1. BT177IU Marine Biotechnology (3,1)
2. AR305IU Modeling in Natural Resource Management (3,1)
3. AR306IU Integrated Coastal Zone Management (3)
4. AR307IU Aquaculture System Design (2,1)
5. AR308IU Fish Nutrition and Feed Formulation (3,1)
6. AR309IU Live Food Production (2,1)
7. AR310IU Fish Diseases (3,1)

## C.FOOD TECHNOLOGY

The curriculum is designed based on students' English level as the followings:

- English level 1 (*Standard*): TOEFL  $\geq 500$  (equivalent TOEFL IBT 60)
- English from level 2:  $430 \leq \text{TOEFL} < 500$  (student need to complete Intensive English 2 course first)
- English from level 3: TOEFL  $< 430$  (student need to complete Intensive English 1 and Intensive English 2 course first)

English level 1 (standard) – Total credits accumulation: 139 (including political courses)					
Semester 1			Semester 2		
MA001IU	Calculus 1	4	MA002IU	Calculus 2	4
PH013IU	Physics 1	2	PH014IU	Physics 2	2
BT155IU	Biology	3, 1	PE008IU	Critical Thinking	3
PT001IU	Physical Training 1	3	CH009IU	Organic Chemistry	3
CH011IU	Chemistry for Engineers	3	PT002IU	Physical Training 2	3
CH012IU	Chemistry Laboratory	0,1	EN011IU EN012IU	AE2	4
EN007IU EN008IU	AE1	4			
SUMMER SEMESTER					
PE011IU	Principles of Marxism	5	PE014IU	Environmental Science	3
Semester 3			Semester 4		
FT201IU	Introduction to Food Science and Technology	3	FT203IU	Food Engineering Principle	4
PE013IU	Revolutionary Lines of Vietnamese Communist Party	2	FT204IU	Food Microbiology	3, 1
BT164IU	Microbiology	3, 1	FT205IU	Nutrition and Functional Foods	3
FT202IU	Food Chemistry	3	FT206IU	Enzyme and Food Fermentation	2, 1
BT156IU	Biochemistry	3, 1	BT152IU	Biostatistics	2, 1
PE012IU	Ho Chi Minh's Thoughts	3			

Semester 5			Semester 6		
FT301IU	Food Unit Operations 1	3 , 1	FT304IU	Food Unit Operations 2	3 , 1
FT302IU	Food Analysis	3 , 1	FT305IU	Food Quality Assurance Systems	3
FT303IU	Toxicology and Food Safety	3	FT307IU	Food Microbiology Analysis	2 , 1
FT306IU	Food Packaging and Food Additives	3	BT206IU	Experimental Design	3
	<b>Elective courses 1</b>	3		<b>Elective course 1</b>	3
<b>SUMMER SEMESTER</b>					
BTFT409IU	Internship	0 , 2			
Semester 7			Semester 8		
	<b>Elective courses 2</b>	<b>8</b>	BT179IU	Thesis	12
FT407IU	Food Sensory Analysis	2 , 1			
FT408IU	Food Product Development and Marketing	2 , 1			

#### Elective courses 1(min. 6 credits)

1. IS050IU Project Management (3)
2. BA115IU Introduction to Business Administration (3)
3. BA164IU Production and Operation Management (3)
4. BA022IU Logistics and Supply Chain Management (3)
5. BA006IU Business Communication (3)

#### Elective courses 2(min. 8 credits)

1. FT401IU Dairy Product Technology (3,1)
2. FT402IU Beverage Technology (3,1)
3. FT403IU Cereal Product Technology (3,1)
4. FT404IU Aquatic Product Technology (3,1)
5. FT405IU Meat Product Technology (3,1)
6. FT406IU Technology of Coffee, Tea and Cacao (3,1)

## D.BIOCHEMISTRY

The curriculum is designed based on students' English level as the followings:

- English level 1 (*Standard*): TOEFL  $\geq 500$  (equivalent TOEFL IBT 60)
- English from level 2:  $430 \leq \text{TOEFL} < 500$  (student need to complete Intensive English 2 course first)
- English from level 3: TOEFL  $< 430$  (student need to complete Intensive English 1 and Intensive English 2 course first)

English level 1 (standard) – Total credits accumulation: 148 (including political courses)					
Semester 1			Semester 2		
MA001IU	Calculus 1	4	BC102IU	Introduction to Biochemistry	2,0
PH013IU	Physics 1	2	PH014IU	Physics 2	2
BT155IU	Biology	3, 1	PE008IU	Critical Thinking	3
PT001IU	Physical Training 1	3	BC101IU	Inorganic Chemistry	3, 1
CH011IU	Chemistry for Engineers	3	BT152IU	Biostatistics	3, 0
CH012IU	Chemistry Laboratory	0,1	PT002IU	Physical Training 2	3
EN007IU EN008IU	AE1	4	EN011IU EN012IU	AE2	4
SUMMER SEMESTER					
PE011IU	Principles of Marxism	5	PE014IU	Environmental Science	3
Semester 3			Semester 4		
BC201IU	Organic Chemistry 1	3	BC204IU	Instrumental Analysis	3,1
PE012IU	Ho Chi Minh's Thoughts	3	BC206IU	Organic Chemistry 2	3, 0
BC203IU	General Biochemistry 1	3	BC207IU	Organic chemistry lab	0,2
BC202IU	Fundamentals of Analytical Chemistry	3,1	BC205IU	General Biochemistry 2	3,2
BT163IU	Human and Animal physiology	3, 0	BT164IU	Microbiology	3,1
BT200IU	Scientific Writing Workshop	2,0	PE013IU	Revolutionary Lines of Vietnamese Communist Party	2

Semester 5			Semester 6		
BC301IU	Enzymology	3, 1	BC405IU	Fermentation Technology	3,1
BC302IU	Biophysical Chemistry	3	BC307IU	Cell culture technology	3,1
BC303IU	Methods in Biochemistry 1	3,1	BC305IU	Methods in Biochemistry 2	3,1
BC304IU	Biopharmaceutics	3		<b>Elective course 1</b>	6
BT203IU	Bioinformatics	3,1			
<b>SUMMER SEMESTER</b>					
BC309IU	Internship	0,2			
Semester 7			Semester 8		
	<b>Elective courses 2</b>	<b>12</b>	BT179IU	Thesis	12
BC403IU	Clinical Biochemistry	3,1			

#### Elective courses 1 (min. 6 credits)

1. IS050IU Project Management (3)
2. BA164IU Production and Operation Management (3)
3. IS029IU Logistics and Supply Chain Management (3)
4. BA003IU Principles of marketing (3)

#### Elective courses 2 (min. 12 credits)

1. BC302IU Nutritional Biochemistry (3,1)
2. BC402IU Nutrition therapy (3,1)
3. BT209IU Drug Design and Simulation (3,1)
4. BC403IU Drug synthesis (3,1)
5. BT184IU Molecular Diagnostics (3,1)
6. BC406IU Clinical Nutrition (3,1)

# COURSE DESCRIPTION

GENERAL SUBJECTS	
<b>Academic English</b> <b>(AE1, AE2)</b> <b>EN007IU, EN008IU</b> <b>EN011IU, EN012IU</b>	<p>This course trains students in strategic note taking skills, i.e., outlining, indentation, abbreviations, classifications, sharing and reorganizing notes, etc., needed to absorb academic lectures and to effectively prepare for examinations. Teaching and learning methods: In the first half of the semester, lessons will be generally conducted in the form of lectures and strategies demonstrations followed by students practicing the skills just presented. During the second half of the semester, student will discuss the lecture topic, review key vocabulary, and make predictions prior to their listening and individual note taking. An accuracy check of their notes will follow and then students will engage in collaborative oral activities reviewing the lecture prior to taking Unit tests.</p>
<b>Calculus 1</b> <b>MA001IU</b>	<p>To provide the students with</p> <ul style="list-style-type: none"> <li>- The main notions and techniques of calculus concerning limits, continuity, differentiation and integration</li> <li>- Elementary concepts of linear algebra are also introduced.</li> <li>- Many applications explain how to use these notions and techniques in practical situations.</li> </ul> <p>Functions; Limits; Continuity; Derivatives, Differentiation, Derivatives of Basic Elementary Functions, Differentiation Rules; Applications of Differentiation: L'hospital's Rule, Optimization, Newton's Method; Anti-derivatives; Integrals, Definite Integral, Fundamental Theorem of Calculus; Techniques of Integration; Improper Integrals; Applications of Integration: Areas, Volumes, Arc length, Other Applications; Matrices, Eigenvalues, Eigenvectors; Determinants, Invertible Matrices; Systems of Linear Equations.</p>
<b>Calculus 2</b> <b>MA002IU</b>	<p>This course provides applied calculus for life science students using textbooks with many citations from current data sources. It also offers many opportunities for use of new teaching methods, allowing for increased visualization and a better understanding of mathematical concepts. Numerical Integration, Integration by Parts, Volume and Average Value, Improper Integrals, Functions of several variables, Partial derivatives, Maxima and minima, Total differentials and approximations, Double integrals, Solution of Linear Systems, Addition and Subtraction of Matrices, Multiplication of Matrices, Matrix Inverses, Eigenvalues and Eigenvectors; Solutions of Elementary and Separable Differential Equations, Linear First-Order Differential Equations, Euler's Method, Linear Systems of Differential Equations, Nonlinear Systems of Differential Equations, Applications of Differential Equations.</p> <p><b>Prerequisite: Calculus 1</b></p>
<b>Physics 1</b> <b>PH013IU</b>	<p>This course introduces the basic knowledge of physics for undergraduate students. The course introduces and reviews the theoretical backgrounds of fundamentals of physics. It covers from mechanics, thermodynamics, electricity, magnetism, optics to atomic and nuclear physics. The knowledge</p>



	then will be used to specifically describe the applications of physics in the field of medical/biotechnology.
<b>Physics 2</b> <b>PH014IU</b>	<p>This course provides students basic knowledge about fluid mechanics; macroscopic description of gases; heat and the first law of thermodynamics; heat engines and the second law of thermodynamics; microscopic description of gases and the kinetic theory of gases.</p> <p><b>Prerequisite: Physics 1</b></p>
<b>Organic Chemistry</b> <b>CH009IU</b>	<p>This course is designed for non-chemistry majors, as it is intended for students pursuing a degree in biotechnology. The course is divided into two parts. The first part covers the basic fundamentals of general, organic chemistry and properties of organic compounds as needed to understand the organic chemistry of living cells, analytical chemistry, physiology and biochemistry. The second part focuses on organic chemistry of living cells, including the chemistry of carbohydrates, lipids, amino acids and nucleic acids.</p> <p><b>Prerequisite: Biology</b></p>
<b>Analytical Chemistry</b> <b>CH013IU</b>	<p>This course is designed for non-chemistry majors, as it is intended for students pursuing a degree in biotechnology. The course covers the basic principles of analytical chemistry. In addition, the course also introduces the modern analytical chemistry and instrumental techniques with emphasis on techniques relevant to analysis in biochemistry. Some applications of bioanalytical techniques will be discussed.</p>
<b>Chemistry for Engineers</b> <b>CH011IU</b>	<p>This one-semester course is designed for engineering students those who are pursuing a nonchemistry</p> <p>engineering degree such as information technology, bio-technology, civil, biomedical,</p> <p>electronic and telecommunication engineering. The course will introduce the basic principles of</p> <p>chemistry and connect those principles to issues in engineering professions. The related lab-work is</p> <p>not included in this course.</p>
<b>Chemistry Laboratory</b> <b>CH012IU</b>	<p>This course is designed for non-chemistry majors, as it is intended for students pursuing a degree in information technology, electronic and telecommunication. The course introduces the lab-work with emphasis on techniques relevant to engineering in chemistry.</p>
<b>Project Management</b> <b>ISI206IU</b>	<p>This course provides the foundation knowledge for student on project management which strengthens their competence on competitive labour market, as well as equip them with a strong skill to organize and manage the project in the future career.</p>
<b>Critical Thinking</b> <b>PE008IU</b>	<p>CriticalThinkingstudies a process which is indispensable to all educated persons -the process by which we develop and support our beliefs and evaluate the strength ofarguments made byothers in real-life situations. It includes practice in inductive and deductive reasoning, presentation of arguments in oral and written form, and analysis of these of language to influence thought. The course also applies the reasoning process to other fields such as business, science,law, social</p>

	science, ethics, and the arts.
<b>Environmental Science</b> <b>PE014IU</b>	This course provides the basic knowledge of environmental science that includes general issues, ecology, and the impact of human activities to natural resources and environment and sustainable development. The course topics will include all general issues; ecology: the basics of environmental science; population growth and utilization of natural resources and the environment; natural resources and current exploitation; pollution and its impacts and sustainable development. It also aims at increasing general awareness of the students about possible impacts of human activities on the environment and natural resources in order to justify relevant economic practices
<b>Business Communication</b> <b>BA006IU</b>	This course covers both the theories and tools needed to build and manage e-commerce sites. Specific topics include e-commerce business models, marketing, security, hosting options, secure-transactions, web server installation and configuration, web services and interfacing with legacy systems.
<b>Introduction to Business Administration</b> <b>BA115IU</b>	<ul style="list-style-type: none"> <li>- To provide knowledge of the scope, depth, and mission of the University</li> <li>- To introduce the functional areas of business and the integration among them</li> <li>- To give students a strong awareness of global issues, including an understanding of approaches to business ethics and multinational issues</li> <li>- To develop students' basic research, analysis, writing, computer, teaming, and presentation skills</li> <li>- To develop students' applied critical thinking skills and communication through the development of a portfolio of a firm in an industry in which they are interested.</li> </ul>
<b>Internship</b> <b>BT200IU, BTAR312IU, BTFT409IU, BTBC309IU</b>	This course is designed as part of an on-the-job training system for professional career. Student will be able to articulate and apply principles learned in and outside of the classroom; gain self-understanding, self-confidence, and interpersonal skills; develop work competencies for a specific profession or occupation and student will explore career options, and gain general work experience.

<b>Subjects belong to Department of Biotechnology</b>	
<b>Biology</b> <b>BT155IU</b>	The course covers some central concepts in biology. Topics ranging from molecules, cellular structure and function, photosynthesis, cellular respiration, cellular reproduction, plant and animal biology to genetics and its application in biotechnology, evolution and biodiversity are all discussed within the context of fundamental principles that pervade all organisms. The laboratory includes basic laboratory skills such as safety, microscope use, and measurement, and it reinforces topics discussed in lecture.
<b>Introduction to Biotechnology</b> <b>BT150IU</b>	This course presents the summary of aspects of biotechnology including the history, the general view of molecules and cells, immunology, microbiology, plants and animal, genomics and their own applications. Each major is structured in one lecture. The lectures are organized in lessons in theory and applications. After each, there might be one seminar presented by expert from

	<p>school of biotechnology and/or invited from outside who are specified in certain areas. Students attend the class will be required to prepare an assignment on which they most concern in biotechnology under lecturer's guidance.</p>
<b>Genetics</b> <b>BT162IU</b>	<p>This course introduces the mechanisms of inheritance and gene action from molecular to population levels. Topics include: mendelian principles; extension of mendelian principles; genetic materials and gene expression; quantitative genetics and population genetics.</p> <p><b>Prerequisite: Biology</b></p>
<b>Plant Physiology</b> <b>BT010IU</b>	<p>Plant physiology is a foundation course for more advanced ones in plant biotechnology. This course covers a wide range of knowledge regarding plant physiology such as plant metabolism, development and essential conditions for development, environmental stresses and secondary metabolites and engineered plants.</p> <p><b>Prerequisite: Biology</b></p>
<b>Biostatistics</b> <b>BT152IU</b>	<p>It is a core major course, provided for sophomore-level students at school of biotechnology. The main content includes: scope, nature, tools, language, and interpretation of elementary statistics. Descriptive statistics; graphical and numerical representation of information; measures of location, dispersion, position, and dependence; exploratory data analysis. Elementary probability theory, discrete and continuous probability models. Inferential statistics, point and interval estimation, tests of statistical hypotheses. Inferences involving one or two populations, ANOVA, correlation and regression analysis, and chi-square tests; use of statistical computer packages (SPSS).</p>
<b>Biochemistry</b> <b>BT156IU</b>	<p>The course is designed for graduate students with background or interest in biochemistry, pharmacology, molecular biology and undergraduate students who wish to develop a deep understanding of biological processes in living organisms. This course will introduce advanced concepts in enzyme catalytic activities and metabolisms of carbohydrates, fatty acids, amino acids, nucleic acids and proteins with a focus on their biosynthesis. In addition, recent advances in biochemistry, molecular biology and biotechnology will be presented throughout the course.</p> <p><b>Prerequisite: Biology</b></p>
<b>Microbiology</b> <b>BT164IU</b>	<p>This microbiology course is designed for the biotechnology major interested in learning about the microbial world. In this course, students will study the fundamental structural and metabolic characteristics of microorganisms, the interactions between them and their environments; and will learn basic techniques for enrichment, selection, isolation, enumeration and identification. The course also offers introductory information on the applications of microorganisms in a number of different industries.</p> <p><b>Prerequisite: Biology</b></p>

<b>Cell Biology</b> <b>BT212IU</b>	<p>Cell biology is a foundation of the life sciences house. This course tells you the story of the birth, life, and death of cells. It provides a firm foundation for study of life sciences. The course concentrates on describe two part of a cell: the structure and the work of cell. All organelles and macromolecules within the cell will be described, then, discusses about the role of each in cell growth, cell divide, cell transport, and cell signalling. For each activity of the cell, the mechanisms will be described to explain how the cell plays their work in the organism. Beside the basic knowledge the course also provides information about the applications of chemicals in treatment of human diseases based on their stimulation or inhibition on cell at molecular level.</p> <p><b>Prerequisite: Biology</b></p>
<b>Human and Animal Physiology</b> <b>BT163IU</b>	<p>Physiology explains the physical and chemical factors that are responsible for the origin, development, and progression of life. The vast field of physiology can be divided into cellular physiology, plant physiology, human and animal physiology. Human and animal physiology explains the specific characteristics and mechanisms of the human body that make it a living being, human and animal physiology explains the functions of tissues, organs and systems with the regulation and control mechanisms of body.</p> <p><b>Prerequisite: Biology</b></p>
<b>Molecular Biotechnology</b> <b>BT168IU</b>	<p>This course introduces students to molecular biotechnology, a scientific discipline arises from the combination of recombinant DNA technology and biotechnology. Students will learn the key recombinant DNA techniques, which including polymerase chain reaction, DNA cloning and sequencing, the principles of expression of recombinant proteins in prokaryotic and eukaryotic systems, in particular strategies to improve the yield of recombinant products in prokaryotic systems. Molecular biotechnology has great contribution in many aspects of our life, ranging from human health care to agriculture and environment. Selected examples of these applications will be studied in this course. In addition, various ethical issues related to the exploitation of molecular biotechnology will be considered.</p> <p><b>Prerequisite: Genetics</b></p>
<b>Immunology</b> <b>BT205IU</b>	<p>This course presents student fundamental knowledge of Immunology. It describes the components and functions of the immune system, mechanisms of innate and adaptive immunity at different levels and to different invading microorganisms such as fungi, bacteria, protozoa, worms and viruses. Wide-ranged applications of Immunology in vaccine production, allergy treatment, autoimmune diseases, cancer, monoclonal antibody, and in tissue or organ transplantation are included in the course. Techniques and approaches used in immunological researches will also be presented.</p> <p><b>Prerequisite: Biology</b></p>
<b>Molecular Genetics</b> <b>BT217IU</b>	<p>This course introduces the integration of classical genetics and modern molecular biology. Topics include: Mechanisms of gene control and nature of mutation in both prokaryotes and eukaryotes; Application of key molecular genetic techniques in the laboratory and in practice; Genomics and proteomics</p>

	studies; Introduction to bioinformatics; QTL analysis for quantitative traits; and Basic data/sequence analysis.
<b>Bioinformatics</b> BT203IU	<p>The course provides a broad introduction to the entire field of bioinformatics and is specifically designed for students majoring in biotechnology. The basics of bioinformatics are explained, followed by discussions of the state-of-the-art computational tools available to solve biological research problems. All key areas of bioinformatics are covered including biological databases, sequence alignment, gene and promoter prediction, molecular phylogenetic, structural bioinformatics, genomics and proteomics. Some applications of bioinformatics in drug design will be introduced at the end of the course.</p> <p><b>Prerequisite: Biology</b></p>
<b>Experimental Design</b> BT216IU	<p>This course is to assist third-year or final-year students with designing and implementing experiments. Together with the Biostatistics and Scientific Writing Workshop courses this is expected make students ready for the final year project. Lectures include an introduction to scientific research, hypothesis testing and experimental design in life sciences. Students are requested to conduct a course project that is used to evaluate how theory is applied in practice as well as to develop inter-personal skills.</p>
<b>Medical Genetics</b> BT211IU	<p>Medical genetics is a required course for Medical Biotechnology program. It involves the application of genetic principles in the practice of medicine. Medical genetics encompasses diagnosis and treatment of genetic diseases, study of inheritance of diseases in families, mapping of disease genes to their chromosome locations, study of the molecular genetics and pathogenesis of inherited disorders, provision of genetic counselling for families, and recently, investigations of methods for gene therapy. Medical geneticists care for fetuses in utero, new-borns, children, and adults with inherited conditions, adults with infertility or recurrent miscarriages, and adults who are genetically predisposed to cancer. Unlike any other field, genetics represents a true integration between the basic and the clinical sciences.</p> <p><b>Prerequisite: Cell Biology, Genetics</b></p>
<b>Crop Biotechnology</b> BT214IU	<p>This course introduces students to genetic engineering for crop improvement: plant cell and tissue culture, gene transfer techniques into plant cells, application in agricultural and food industries.</p> <p><b>Prerequisite: Plant Physiology, Plant Science</b></p>
<b>Techniques in Plant Biotechnology</b> BT201IU	<p>This course introduces students to techniques of plant biotechnology: plant cell and tissue culture, genetic engineering of plants, plant transformation vectors.</p> <p><b>Prerequisite: Plant Physiology, Plant Science</b></p>
<b>Algal Biotechnology</b> BT215IU	<p>The course introduces students a relatively new scientific research area of algal biotechnology compared with other sciences. Several fundamental sciences such as biochemistry, plant physiology and molecular biology are</p>

	<p>applied for the subject. Exploitations of algal biotechnology are introduced in various fields: agriculture, aquaculture, food, pharmacy, medicine and biofuels.</p> <p><b>Prerequisite: Plant Physiology, Molecular Biotechnology, Plant Science</b></p>
<p><b>Marine Biotechnology</b> <b>BT177IU</b></p>	<p>Lectures include an introduction to marine biotechnology, development history and current status, followed by 10 seminars on important applications of biotechnology in mariculture and the production of pharmaceuticals. Practical works emphasize on live food production and the use of beneficial bacteria in disease control and bioremediation.</p> <p><b>Prerequisite: Marine Biology, Molecular Biotechnology</b></p>
<p><b>Environmental Biotechnology</b> <b>BT208IU</b></p>	<p>This course aims at providing knowledge on fundamentals of bioprocesses in environmental technologies and its application in biological wastewater and solid waste reuse, recycling and treatment.</p> <p>The course is organized in 3 main chapters: (1) chapter 1 introduces about the courses and gives general information on the roles of bio-processes in environmental technology and its applications in practice; (2) chapter 2 provides fundamental knowledge on biological processes applied in wastewater treatment and reuse technologies. By going through this chapter, students will have an overview of why bioprocesses play an important role in biological wastewater reuse and treatment; differences among biological processes used to remove organic materials, to implement nitrification and denitrification, phosphorus conversion; deep understanding on modelling and microbial growth kinetics of suspended growth and attached growth treatment processes; gain knowledge about microbiology of different biological processes and environmental conditions of each; (3) chapter 3 gives fundamental knowledge on biological solid waste reuse and treatment. Applications of bioprocess in conversion of biowastes into products such as compost, methane gas and energy through aerobic and anaerobic digestion processes will be discussed in this chapter. It is hopefully that by understanding background of environmental biotechnology, students are able to apply their knowledge in biological technology to improve and enhance biological treatment efficiency in environmental applications. Laboratory work (1 credit) added into this course introduces how to apply theoretical knowledge into practice.</p> <p><b>Prerequisite: Biochemistry</b></p>
<p><b>Pharmaceutical Biotechnology</b> <b>BT185IU</b></p>	<p>This course emphasizes the biotechnological aspects in the pharmaceutical and biopharmaceutical product development based on the fundamentals of recombinant technology and systematic biology and analyzing the products and its application in medicine. This course also emphasizes the principle synthesis and manufacturing processes of monoclonal antibodies, introduction to gene therapy, recombinant therapeutic protein, nano-drugs, biotech compounds and materials used in pharmaceutical and biopharmaceutical fields. This course is designed to provide how to formulate a pharmaceutical and biopharmaceutical products and establish a pharmaceutical pilot.</p>

	<b>Prerequisite: Biochemistry, Molecular Biotechnology</b>
<b>Molecular Diagnostics</b> <b>BT184IU</b>	<p>The molecular diagnostics course concentrates on applying molecular genetic methods in diagnosis of human infectious diseases and human genetic disorders. The lecture and laboratory practical provide all knowledge about the fundamentals of molecular diagnostics methods, the mechanism and application of molecular techniques in detection of causative target of diseases. The course focuses on the applications of pcr-based methods in detection of nucleic acid of virus, bacteria in clinical specimens and in detection of human genetic disorder particularly in prognostic of cancer, and prenatal diagnostic. Application of real-time pcr in diagnostics of human genetic and infectious diseases will also be studied. Besides learning about application of pcr- based method in diagnostics this course will train student in designing a new molecular method for diagnostics.</p> <p><b>Prerequisite: Cell Biology</b></p>
<b>Animal Biotechnology</b> <b>BT174IU</b>	<p>The objective of this course is to introduce students the multidisciplinary area of animal biotechnology: from molecular, cellular, genomics and development issues to their technological applications. This course teaches the basic applications of advanced animal biotechnology in the stem cell, cloning animal, transgenic animals, cell reprogramming, assisted reproductive technology (ART) and their applications in therapy, medicine, and agriculture. The course aims to develop the student skills and knowledge in a specific area of animal bioscience and manipulation of animal cells. Students will study manipulation of germ cells, embryos, ART, somatic cell nuclear transfer, and animal cell culture in laboratory practice.</p> <p><b>Prerequisite: Cell Biology, Human and Animal Physiology</b></p>
<b>Stem Cell Biology</b> <b>BT212IU</b>	<p>This course is designed to convey the current state of the stem cell field and the application of stem cell field in agriculture, food and regenerative biomedicine. Through lectures, student will learn the basic concepts of embryonic and adult stem cells, as well as recent findings in the rapidly advancing stem cell research. In addition, cell reprogramming and stem cell therapy will be discussed. This course also provides criteria or standards for isolating, culturing, maintaining, and characterizing embryonic stem cells from the early mouse embryos.</p> <p><b>Prerequisite: Cell Biology, Human and Animal Physiology</b></p>
<b>Medical Microbiology</b> <b>BT213IU</b>	<p>This course is designed for undergraduate students who are interested and/or would like to be specialized in medical-related field. It brings students practical and applicable knowledge of Medical microbiology whose importance in the human life has made it one of the most complex biological sciences dealing with many diverse biological disciplines including genetics, metabolism, physiology, ecology, infections, disease, diagnostics, therapy, immunology, epidemiology and public health. Medical microbiology will introduce student general knowledge of different infectious diseases causing by bacterial, viral and fungal pathogens. It includes the study of microbial pathogenesis, epidemiology, diagnostics and treatments. Besides, disease pathology and immunology aspect will also be discussed. In practice, this</p>

	<p>course equips student's different techniques to work with various microorganisms of medical importance at lab-scale level.</p> <p><b>Prerequisite: Microbiology, Immunology</b></p>
<p><b>Plant Science</b> BT218IU</p>	<p>A comprehensive study of the plant kingdom, including the structure, physiology and function of plants and their importance in our lives as sources of food, fibre, and pharmaceuticals.</p> <p><b>Prerequisite: Biology</b></p>
<p><b>Marine Biology</b> BT220IU</p>	<p>This course provides an introduction to marine biology and marine ecology. It covers the 'science' of marine biology; describes the ecosystems and cycles that operate within different marine environments; details how organisms have adapted to the extreme abiotic factors; considers the importance of the 'ocean' to life on earth and how man exploration and management of marine resources requires an understanding of the systems generating the resources.</p> <p><b>Prerequisite: Biology</b></p>
<p><b>Scientific Writing Workshop</b> BT200IU</p>	<p>This course is designed to help the students develop and perfect the writing skills that are necessary in the biological sciences. Using the English language, students will learn how to write a scientific paper suitable for submission to an international, peer reviewed journal or for a thesis submission. Students will learn how to critically analyse scientific findings in relation to the hypothesis and current body of knowledge, draw conclusions to and make recommendations; how to research and construct a literature review and to apply the various methods of citing literature. Students will learn how to make an oral presentation and poster presentation.</p>
<p><b>Human Pharmacology</b> BT207IU</p>	<p>Development of the new drug discovery is necessary to treat the serious diseases threatening to human lives. Screening a new and potent drug is important step in drug discovery development. This course is designed as an introduction to pharmacology and toxicology. Pharmacology is broadly defined as the effect of drugs and chemicals on living organisms. This course supplies advantages and disadvantages of routes of administration, the movement way of drug molecules across cell membranes, the drug metabolism and elimination in the body, drug interactions &amp; rationale for drug combinations. The course also lectures how to screen the new drug approved by FDA (Food and Drug Administration), the mechanism of action of and drugs affecting on central nervous system, endocrine and blood system, antimicrobial drugs such as vaccine, peptides and protein; antitumor agents such as monoclonal antibodies</p>
<p><b>Molecular Genetics</b> BT217IU</p>	<p>This course introduces the integration of classical genetics and modern molecular biology. Topics include: Mechanisms of gene control and nature of mutation in both prokaryotes and eukaryotes; Application of key molecular genetic techniques in the laboratory and in practice;</p>



	<p>Genomics and proteomics studies; Introduction to bioinformatics; QTL analysis for quantitative traits; and Basic data/sequence analysis.</p> <p><b>Prerequisite: Cell Biology</b></p>
<p><b>Protein Biotechnology</b> BT172IU</p>	<p>This course presents an intensive summary of protein biotechnology including the genetics, biochemistry, and kinetics of microorganisms used as hosts for protein expression, expression systems, protein engineering methods, screening, combinatorial methods, and the discovery, biochemistry, and production of enzymes of industrial interest. Also included is an introduction to protein purification, protein chromatography, and formulation of therapeutic biopharmaceuticals.</p> <p><b>Prerequisite: Cell Biology</b></p>
<p><b>Pharmacology Genomics</b> BT305IU</p>	<p>This course is designed for students pursuing a degree in pharmaceutical science. The course based on the basic fundamentals of pharmacogenomics including general characterization of genes and drugs, principles of drug metabolism and dosage. This course also supplies the way to use medicine with a limitation of adverse effects. The course helps students how to identify the problems of patients in using medicine. Moreover, this course orients students to develop personalized medicines based on genomic diversities.</p>
<p><b>Drug Design and Simulation</b> BT209IU</p>	<p>The course will give student overview on drug discovery and development process, starting from how drug candidates are found, improved, brought to clinical trials to eventually released to the marketplace. Students will learn about several software applications, databases and computational resources in the field of Computer-aided Drug Designenvir (CADD) and especially will be equipped with several methods to simulate drug-receptor interactions in order to gain insights into how drugs can be found, designed or improved.</p> <p><b>Prerequisite: Bioinformatics</b></p>

Subjects belong to Department of Food Technology	
<p><b>Introduction to Food Science and Technology</b> FT201IU</p>	<p>There are 5 inter-related modules:</p> <p>Introduction to food science. Food production and composition. Nutrients, additive properties. Food safety, regulation, labelling. Introduction to food chemistry, bioch</p> <p>Introduction to food microbiology. Microorganisms, taxonomy, growth conditions. Food-borne illness, poisoning, spoilage and fermentations. Health aspects, probiotics, bioactive peptides.</p> <p>Food processing and preservation. Industrial and business aspects. Engineering, quality control, ecological aspects. Principles of food preservation. Drying,</p>

	<p>freezing, canning, chemical preservatives, irradiation, packaging. Food manufacturing, formulation, functionality. Regulatory aspects. Food laws, inspections, recalls. Food service and the hospitality industry.</p> <p>Major food commodities and products. Cereals, oilseeds, flours, bread, fats and oils, vegetables, fruits, tea, beverages, milk and dairy products, eggs, meat, poultry and fish.</p> <p>Current food issues. Functional foods and nutraceuticals, genetically modified foods, organic foods, minimal processing, non-thermal preservation technologies. Research and development. Careers in food science.</p> <p><b>Prerequisite: Organic Chemistry, Microbiology</b></p>
<b>Food Chemistry</b> <b>FT202IU</b>	<p>Structure and properties of chemical components in food such as proteins, carbohydrates, lipids, dietary fiber, ash, vitamin, etc. The importance and contribution of these component; chemical change of these components during processing and storage; analysis equipment to determine these components in foods.</p> <p><b>Prerequisite: Organic Chemistry</b></p>
<b>Food Engineering Principles</b> <b>FT203IU</b>	<p>It is a fundamental major course, designed for sophomore in Food Technology. It introduces:</p> <ul style="list-style-type: none"> <li>• Basic principles of food process engineering – mass and energy. Food composition, physical properties. Introduction to food processing.</li> <li>• Units and dimensions. SI, CGS, English systems. Conversion factors. Dimensional consistency. Problems - solving examples.</li> <li>• Material balances. Batch and continuous processes. General mass balance equations, algebraic unknowns, tie substance, basics for calculation.</li> <li>• Thermodynamics. Thermodynamic properties. Vapours and gases. Ideal gas law. Real gases. Sensible and latent heat. Enthalpy. Energy balances.</li> <li>• Fluid mechanics. Viscosity. Laminar and turbulent flow. Fluid flow in pipes, pressure drop, friction. Reynolds number. Bernoulli equation.</li> </ul> <p>Heat transfer theory. Conduction, convection, radiation. Fourier's law. Heat transfer applications. Steady state. Forced and free convection equations. Dimensionless numbers. Heat exchangers. Heat transfer coefficients. Problems – solving examples.</p> <p><b>Prerequisite: Physics 2</b></p>
<b>Food Microbiology</b> <b>FT204IU</b>	<p>Microbial ecology related to food, extrinsic effects to food spoilage and food processing, and other physical damage, chemical and biological damage caused by microorganisms in the intrinsic food, public health and hygiene; assignments and experiments.</p> <p><b>Prerequisite: Microbiology</b></p>
<b>Nutrition and Functional Foods</b>	<p>Elements of human nutrition including vitamins, minerals, micronutrients, and antioxidants including sources, metabolism, and functions in the</p>

FT205IU	<p>human body; nutritive values of foods; requirements for human health, nutraceuticals, and functional foods and their effects on human health beyond basic nutrition. Food-related diseases.</p> <p><b>Prerequisite: Biochemistry</b></p>
<p>Enzyme and Food Fermentation</p> <p>FT206IU</p>	<p>Course for the sophomore students, the contents include:</p> <ul style="list-style-type: none"> <li>• Classification and application of enzymes in food processing.</li> <li>• Enzyme reaction mechanism.</li> <li>• Classification, characteristics and origin of microorganisms in the food fermentation.</li> <li>• Metabolic activities of microorganisms and their effects to the nature of the product</li> <li>• Processing of fermented foods.</li> <li>• Growth, maintenance and storage of microorganisms containing desired enzymes.</li> </ul> <p>The problems arise in the fermentation process and settlement methods.</p> <p><b>Prerequisite: Biochemistry</b></p>
<p>Food Unit Operation 1</p> <p>FT301IU</p>	<ul style="list-style-type: none"> <li>• Review of heat transfer phenomena</li> <li>• Structure and physical properties of water</li> <li>• Psychometry</li> <li>• Drying theory</li> <li>• Industrial food drying operations</li> <li>• Quality and stability of dried foods</li> <li>• Theory of freezing effects in foods</li> <li>• Food freezing technology</li> <li>• Responses of foods to industrial freezing</li> <li>• Principles of heat preservation of foods</li> <li>• Thermal resistance of microorganisms and enzymes</li> <li>• Process lethality calculations</li> <li>• Industrial food sterilization processes</li> <li>• Non-thermal food preservation: principles of food irradiation</li> </ul> <p>Principles of high pressure processing</p> <p><b>Prerequisite: Food Engineering Principles</b></p>
<p>Food Analysis</p> <p>FT302IU</p>	<p>Principles in chemical and instrumental analyses using for qualitative and quantitative analyses of moisture, protein, carbohydrate, lipid, dietary fiber, mineral and vitamins. Introduction of the basic techniques in food and microbiology analyses. The advanced methods in food analysis such as</p>

	<p>Gravimetric, volumetric, HPLC, Infrared chromatography, atomic absorption spectroscopy.</p> <p><b>Prerequisite: Organic Chemistry</b></p>
<p><b>Toxicology and Food Safety</b></p> <p><b>FT303IU</b></p>	<p>This course will provide a general understanding of toxicology related to food and the human food chain. Fundamental concepts will be covered including dose-response relationships, absorption of toxicants, distribution and storage of toxicants, biotransformation and elimination of toxicants, target organ toxicity, teratogenesis, mutagenesis, carcinogenesis, food allergy, and risk assessment. The course will examine chemicals of food interest such as food additives, mycotoxins, and pesticides, and how they are tested and regulated. We will explore the etiology of foodborne disease related to naturally-occurring toxins and we will examine the ecology of food.</p> <p><b>Prerequisite: Nutrition and Functional Foods</b></p>
<p><b>Food Unit Operation 2</b></p> <p><b>FT304IU</b></p>	<ul style="list-style-type: none"> <li>• Review of mass transfer <ul style="list-style-type: none"> <li>○ Unit conversions</li> <li>○ Mass balances</li> <li>○ Mass transfer equations</li> </ul> </li> <li>• Distillation</li> <li>• Evaporation/concentration <ul style="list-style-type: none"> <li>○ Thermal concentration</li> <li>○ Freeze concentration</li> </ul> </li> <li>• Unit operations involving mass transfer <ul style="list-style-type: none"> <li>○ Absorption/desorption</li> <li>○ Washing</li> <li>○ Solvent extraction</li> <li>○ Supercritical fluid extraction</li> </ul> </li> <li>• Mechanical separation processes <ul style="list-style-type: none"> <li>○ Sedimentation</li> <li>○ Centrifugation</li> <li>○ Filtration</li> </ul> </li> </ul> <p><b>Prerequisite: Food Unit Operation 1, Food Engineering Principles</b></p>
<p><b>Food Quality Assurance System</b></p> <p><b>FT305IU</b></p>	<p>Methods of quality control and management in food processing; total quality control management, HACCP, ISO 9000 and 14,000 series, control of raw materials, process and finished products; sampling, evaluation of sensory properties and other factors.</p> <p><b>Prerequisite: Food Analysis, Food Microbiology</b></p>
<p><b>Food Packaging and Food Additives</b></p>	<p>The course will be designed in two independent, but related modules:</p>

FT306IU	<ul style="list-style-type: none"> <li>The introductory knowledge in function of food packaging, materials used for food packaging, production of food packaging, packaging systems and equipment and change in food quality during storage in packaging.</li> <li>Classification of food additives allowed to use in food products. Application of food additives in food processing, food preservation and distribution of food products. Toxicity of the food additives. The food improvers are usually used in food processing.</li> </ul> <p><b>Prerequisite: Food Chemistry</b></p>
Food Microbiology Analysis FT307IU	<p>The source of microorganisms, factors affecting the development of food microorganisms (microorganisms that cause decay, disease and toxic). The method of testing the target microorganisms and other microorganisms commonly infected in food products as well as basic principles in food microbiological testing at industrial level.</p> <p><b>Prerequisite: Food Microbiology</b></p>
Dairy Product Technology FT401IU	<p>Processing and technologies of fluid milk plant operation from milk receiving to various finished products. Fluid milk, yogurt, cheese, and frozen dairy desserts; physical, microbiological, and chemical properties of fluid milk and milk components; milk quality supply; good manufacturing practices (GMPs); HACCP, and basic concepts of quality assurance and quality control.</p> <p><b>Prerequisite: Food Unit Operation 2</b></p>
Beverage Technology FT402IU	<p>Introduction of alcoholic and non-alcoholic beverages. the basic principles and producing processes of fruit juice, fruit-like juice, beer, wine and traditional Vietnamese alcohols.</p> <p><b>Prerequisite: Food Unit Operation 2</b></p>
Cereal Product Technology FT403IU	<p>The course supplies the knowledge and techniques for the students to be able to:</p> <ul style="list-style-type: none"> <li>Know how to classify the cereals produced and used as staple foods over the world, especially the cereals popularly used in Vietnam and Asia.</li> <li>Know how to determine the chemical composition, nutritional and functional qualities of the cereals.</li> <li>Understand the principle of the storage and the relationship between the storage process and grain quality and economic benefit.</li> <li>Understand the principle of wet and dry processing and apply these products for food processing.</li> <li>Have a knowledge on bread making: materials and process</li> </ul> <p>Have knowledge on processing other products from cereal grains (beside bread) such as noodle, spaghetti, cake, popcorn, etc.</p> <p><b>Prerequisite: Food Unit Operation 2</b></p>
Aquatic Product Technology	<p>Seafood raw materials and ingredients: sources and composition; Seafood preservation. Basic processes for seafood preservation and processing; Adjuncts</p>

FT404IU	and additives in seafood processing; Seafood product production; Seafood by-product production. Seafood safety, HACCP in seafood factories. <b>Prerequisite: Food Unit Operation 2</b>
Meat Product Technology FT405IU	Meat raw materials: chemical composition and nutrition. The biochemistry of the meat changes after slaughter. Indicators assessing the quality of meat. The basic processes of meat. Additives in the meat industry. The chemical and microbial properties of meat products. Meat microbiology, GMP, HACCP for meat processing application. Basics of quality assurance and quality control. The high technology applied in processing and storage of meat products. <b>Prerequisite: Food Unit Operation 2</b>
Technology of Coffee, Tea and Cacao FT406IU	<ul style="list-style-type: none"> <li>- Overview of post-harvest technology and tea processing.</li> <li>- Overview of post-harvest technology and coffee processing.</li> </ul> <p>Overview of post-harvest technology and cocoa processing, the food products from cocoa <b>Prerequisite: Food Unit Operation 2</b></p>
Food Sensory Analysis FT407IU	This course is to teach third grade of food technology students. The students will learn basic techniques of sensory testing, nerves function in food sensory testing, sensory design, the practical aspects of conducting sensory test using TCVN. <b>Prerequisite: Food Analysis, Biostatistics</b>
Food Product Development and Marketing FT408IU	<p>The course provides knowledge and skills for students to:</p> <ul style="list-style-type: none"> <li>• Understand and have experience in the development of food products.</li> <li>• Knowledge of food ingredients.</li> <li>• Ability to create templates for a new product (prototype).</li> <li>• Able to identify challenges in developing products and schemes to overcome.</li> <li>• Understand the techniques and knowledge related to the consumer.</li> </ul> <p>Development thinking logically related to food products. <b>Prerequisite: Food Unit Operation 2</b></p>

#### Subjects belong to Department of Applied Chemistry

Inorganic Chemistry BC101IU	<p>This course is specifically designed for students of Biochemistry. This course focuses on the fundamentals of inorganic chemistry and its relevancy to biochemistry. The provided knowledge will form a foundation for biochemistry students in their further studies. The course's content includes studies of trends in reactivity, structures and properties of the elements and their compounds, and biological inorganic chemistry.</p> <p><b>Prerequisite: General Chemistry</b></p>
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<b>Introduction to Biochemistry</b> <b>BC102IU</b>	<p>Biochemistry is the study of the molecular basic of life. This one-semester course is designed for Biochemistry students those who are pursuing a Bachelor degree in Biochemistry. This course will emphasize on the fundamental concepts and language of biochemistry. The topics covered are the basic concepts of four major of biological molecules, carbohydrates, lipids, proteins and nucleic acids. Topics also include the basic concepts of energy transfer, methabolic pathways, storage and transfer information.</p>
<b>Organic Chemistry 1, 2</b> <b>BC201IU, BC206IU</b>	<p>This course is specifically designed for students of Biochemistry. It is part of 2-semester course in Organic chemistry. This particular module provides fundamental information on aspects of stereochemistry and the basics of addition, substitution and elimination reactions, functional groups, saturated and aromatic heterocyclic compounds.</p> <p><b>Prerequisite: General Chemistry (Organic Chemistry 1); Organic Chemistry 1 (Organic Chemistry 2)</b></p>
<b>Fundamentals of Analytical Chemistry</b> <b>BC202IU</b>	<p>This two-semester course is designed to provide the fundamentals of analytical chemistry along with practical principles for working in laboratories, as a requirement for students of biochemistry.</p> <p><b>Prerequisite: General Chemistry</b></p>
<b>General Biochemistry 1</b> <b>BC203IU</b>	<p>This course is part of two-part general biochemistry designed for students who are pursuing the bachelor degree in biochemistry. Course covers some central concepts in general biochemistry. Topics include the sources, classification, properties, functions of 4 macromolecules (carbohydrates, lipids, proteins and nucleic acids) and vitamins.</p> <p><b>Prerequisite: Organic Chemistry 2</b></p>
<b>Instrumental Analysis</b> <b>BC204IU</b>	<p>This course is designed to provide the fundamentals of instrumental analysis along with practical principles for working in laboratories, as a requirement for students of biochemistry.</p> <p><b>Prerequisite: Fundamental of Analytical Chemistry</b></p>
<b>General Chemistry 2</b> <b>BC205IU</b>	<p>The course is designed for students who are pursuing the bachelor degree in biochemistry. The course provides students with emphasis on the bioenergetics, control and regulation of different metabolic pathways. Topics will include the principles of bioenergetics; degradation and biosynthesis of carbohydrates, fatty acids, amino acids and nucleic acids; signal transduction; oxidative phosphorylation; integration and regulation of metabolism.</p> <p><b>Prerequisite: General Biochemistry 1</b></p>
<b>Organic Chemistry Lab</b> <b>BC207IU</b>	<p>The organic chemistry laboratory course introduces the student to fundamental techniques and procedures in extraction, purification, synthesis and characterization of organic compounds and simple reactions used in the organic chemistry laboratory. In addition, the student will be trained in the proper way to write a scientific laboratory report.</p> <p><b>Prerequisite: Organic Chemistry 2</b></p>

<b>Enzymology</b> <b>BC301IU</b>	<p>The course provides students with knowledge on the structure and function of enzymes, with special reference to molecular mechanisms underlying the catalytic activity, and mechanisms of inhibition and modulation. Introduction to some of basic techniques for the extraction, purification and characterization of the enzymes. Some typical enzymes are also introduced to students on this occasion.</p> <p><b>Prerequisite: General Biochemistry 2</b></p>
<b>Biophysical Chemistry</b> <b>BC302IU</b>	<p>This course emphasizes basic principles in thermodynamics, including the concepts of energy, enthalpy, entropy, free energy, with connections to statistical thermodynamics; physical and chemical equilibrium of biological systems.</p> <p><b>Prerequisite: Biology, General Chemistry</b></p>
<b>Nutritional Biochemistry</b> <b>BC311IU</b>	<p>This course aims to provide a basic understanding of the metabolism of macro and micronutrients and of the role of nutrition in influencing cell growth, cancer development, blood formation and gene function. Emphasis will be on clinical relevance, the integration of biochemical pathways and how this is modulated by dietary change, and on techniques used to assess both normal dietary requirements and nutrient deficiencies. Students will be introduced to biochemical mechanisms of energy expenditure and storage, including metabolic adaptation to periods of fasting or food intake.</p> <p><b>Prerequisite: General Biochemistry 2</b></p>
<b>Methods in Biochemistry 1</b> <b>BC303IU</b>	<p>This course aims to provide a basic understanding of the techniques in biochemistry. Students will be able to perform common techniques such as qualitative and quantitative analysis and characterization of macromolecules.</p> <p><b>Prerequisite: General Biochemistry 2, Analytical Chemistry 2</b></p>
<b>Biopharmaceutics</b> <b>BC304IU</b>	<p>This one-semester course is designed for Biochemistry students those who are pursuing a Bachelor degree in Biochemistry towards medicine and pharmacy. The processes of absorption, distribution, metabolism, and excretion of drugs are introduced with the purpose of improving the evaluation of drug delivery systems, and the therapeutic management of patients. Additionally, the relevance to generic substitution of drugs is described. The course covered includes the physicochemical principles of pharmacy, such as acid-base theory, solubility, physical states of drugs, thermodynamics, drug stability, excipients, surfactants, dispersions, polymers, drug delivery, chemical compatibility and interactions of drugs in various dosage forms.</p> <p><b>Prerequisite: General Biochemistry 2</b></p>
<b>Methods in Biochemistry 2</b> <b>BC305IU</b>	<p>This course aims to provide a basic understanding of the techniques in biochemistry. Students will be able to isolate and analyse the complex structure of gene in human body. Besides, student will also learn the techniques in protein preparation such as separation, recombinant, and sequences.</p> <p><b>Prerequisite: Methods in Biochemistry 1</b></p>



<b>Fermentation Technology</b> <b>BC405IU</b>	<p><b>Prerequisite: Enzymology, General Biochemistry 2</b></p>
<b>Cell Culture Technology</b> <b>BC307IU</b>	<p>This one-semester course is designed for Biochemistry students those who are pursuing a Bachelor degree in Biochemistry towards medicine and pharmacy. Topics covered include application of plant cell culture technology in producing bioactivity products; bioreactor technology and drugs of natural origin; metabolic engineering of plant secondary metabolism; and extraction of phytocomponents.</p> <p><b>Prerequisite: General Biochemistry 2</b></p>
<b>Nutrition Therapy</b> <b>BC402IU</b>	<p>This course enables the student to understand the introductory knowledge of diet therapy and planning the nutritional care in clinical setting. This course also enables the student to deal with obesity and diabetes problems.</p> <p><b>Prerequisite: Clinical Nutrition</b></p>
<b>Clinical Biochemistry</b> <b>BC406IU</b>	<p>This course aims to provide a basic understanding of the techniques in diagnostics of various diseases. You will be able to analyse the complex structure of bio-molecules in human body such as glucose, bilirubin, creatinine, ALT, AST and etc.</p>
<b>Drug synthesis</b> <b>BC403IU</b>	<p>This course will emphasize on the application of organic synthesis towards the development of pharmaceutical targets. The important organic reactions in drug synthesis are covered, followed by discussions of some relevant drug target syntheses. The course will provide the groundwork for learning medicinal chemistry and pharmaceutical technology.</p> <p><b>Prerequisite: General Biochemistry 1</b></p>
<b>Clinical Nutrition</b> <b>BC406IU</b>	<p>This course presents the principles and practice of scientifically based clinical nutrition. Topics discussed include nutritional assessment (nutritional implications of the physical exam, laboratory studies, and more), macronutrients, micronutrients, phytonutrients, enzymes, and other factors. Various conditions are discussed with emphasis on understanding that they are different expressions of imbalances and/or dysfunction that are preventable and correctable in many cases. Besides, students learn how to set up plan on nutrition care based on the clinical biochemistry tests and patient diagnostics and monitoring and evaluating the process of nutrition care.</p> <p><b>Prerequisite: Clinical Biochemistry</b></p>

Subjects belong to Department of Aqua Science	
<b>Aquatic Ecology</b> <b>AR101IU</b>	<p>Aquatic Ecology course provides basic knowledge about: ecology and ecological characteristics of living organisms in aquatic environment; organic environment, biomes and their relationship in the aquatic areas of freshwater, brackish and salt water; ecosystem, basic characteristics of ecosystem and take advantage of them in management of aquatic resources.</p> <p><b>Prerequisite: Biology</b></p>
<b>Introduction to Aquatic Resource Management</b> <b>AR102IU</b>	<p>This course provides basic knowledge about natural resources, aquatic resources, current exploitation and management, threats and interference ability of science and technology.</p>
<b>Aquatic Microbiology</b> <b>AR201IU</b>	<p>Aquatic microbiology introduces to student knowledge about characteristics of aquatic microorganisms, such as micro-algae, bacteria, yeasts, viruses; their role in the cycles of physical transformation; applying in fisheries sector.</p> <p><b>Prerequisite: Biology</b></p>
<b>Global Climate Change</b> <b>AR202IU</b>	<p>Global climate changes course provides students with knowledge and updated information about the causes of climate change, progress and prediction. The interaction between climate change and aquaculture, Aquatic Resource Management is considered as the key component of the course, helping students to orient future practices in a way that makes use of these changes and at the same time avoid.</p> <p><b>Prerequisite: Biology, Aquatic Ecology</b></p>
<b>Laboratory Methods</b> <b>AR203IU</b>	<p>Provide students with knowledge of basic methods commonly used in biological studies of aquatic animals such as (i) how to collect and process biological research samples, (ii) morphological study, (iii) nutrition study, (iv) reproductive biology study, (v) study on age and growth, (vi) research on biological community, and (vii) assessment and stocking of aquatic animals.</p>
<b>Field Course</b> <b>AR204IU</b>	<p>This course is a compulsory one. Students will assess the resource status of a particular water body and its characteristics. Main issues are physical and chemical characteristics of water, organism community, and environmental impact assessment.</p> <p><b>Prerequisite: Aquatic Ecology, Laboratory Method</b></p>
<b>Fish Physiology</b> <b>AR205IU</b>	<p>This course provides knowledge about physiology of fish with a special focus on tropical species. Key topics include: fish development, circulation system, respiration, metabolic processes, osmoregulation, hormonal control in reproduction.</p> <p><b>Prerequisite: Biology</b></p>
<b>Hatchery Technology</b>	<p>This course provides the basic knowledge of artificial propagation for aquatic species, including establishment of broodstock population, broodstock</p>

<b>AR301IU</b>	<p>conditioning, induce-spawning, larval and juvenile rearing, principles of hatchery design and hatchery operation.</p> <p><b>Prerequisite: Aquatic Ecology, Fish Physiology</b></p>
<b>Aquaculture Genetics and Selective Breeding</b> <b>BTAR302IU</b>	<p>This course introduces the theoretical basis for breeding and selection in aquaculture species. Topics include: Basic principles of inheritance based on a single locus; basic statistical parameters and prediction of breeding value, breeding strategies and selection approaches, design of breeding programs, and molecular genetic methods to identify DNA markers and their applications.</p> <p><b>Prerequisite: Genetic, Biostatistics</b></p>
<b>Monitoring of Aquatic Environment and resources</b> <b>BTAR303IU</b>	<p>This course aims at providing knowledge about "Monitoring of aquatic environment and resources" or "Monitoring Aquatic Resources" for students in ARM major or other interested majors. This course will provide students with knowledge and skills to design and implement an aquatic resources and environment monitoring program, as well as providing tools for doing monitoring including chemical indicators, biological indicators, and biomarkers for ecosystem health.</p> <p><b>Prerequisite: Aquatic Ecology, Laboratory Methods</b></p>
<b>Fisheries Management</b> <b>BTAR304IU</b>	<p>Students will gain the key features of fisheries in Vietnam and its current status of fisheries management.</p> <p><b>Prerequisite: Aquatic Ecology</b></p>
<b>Modelling in Natural Resource Management</b> <b>BTAR305IU</b>	<p><b>Prerequisite: Aquatic Ecology, Introduction in Aquatic Resource Management</b></p>
<b>Integrated Coastal Zone Management</b> <b>BTAR306IU</b>	<p>Habitat demand and industrial development of multi-disciplines along coastal zones cause several conflicts of using water, land and related resources. The course of Integrated Coastal Zone Management equips students with the understanding and improved skills of management to balance the benefits and minimize the conflicts resulting from any development plans and uses of water and related resources. Many case-studies of integrated coastal zone management from Vietnam and the world will be used to demonstrate the course.</p> <p><b>Prerequisite: Aquatic Ecology, Introduction to Aquatic Resource Management</b></p>
<b>Aquaculture System Design</b> <b>BTAR307IU</b>	<p><b>Prerequisite: Biology</b></p>

<b>Fish Nutrition and Feed Formulation</b> <b>BTAR308IU</b>	<p>This course addresses many aspects of nutrition of aquaculture species, including the nutritional and energy requirements of cultured aquatic animals. Students who completed this course will be able to analyse the nutrients of various feed ingredients and to develop a diet formulation for certain aquaculture species. In addition, the students would carry out the trial to evaluate the roles of dietary nutrients for development and growth of aquatic species.</p> <p><b>Prerequisite: Biology, Laboratory methods, Fish Physiology</b></p>
<b>Live Food Production</b> <b>BTAR309IU</b>	<p><b>Prerequisite: Aquatic Ecology, Laboratory Methods</b></p>
<b>Fish Diseases</b> <b>BTAR310IU</b>	<p>‘Fish diseases’ is a compulsory course; this course provides basic knowledge about fish diseases, common diseases, disease diagnostic and testing, effective methods for prevention and treatment.</p> <p><b>Prerequisite: Laboratory Methods, Fish Physiology</b></p>
<b>Environmental Impact Assessment</b> <b>BTAR311IU</b>	<p>This course will provide students with knowledge and skills for analysis, forecasting, and doing risk assessment of projects. It aims to provide students with the basic skills for assessing and forecasting qualitatively and/or quantitatively the possible impacts of the projects to related stakeholders or ecosystem, as well as proposing the measures to prevent and minimize adverse effects, making environmental impact assessment reports for projects involving aquaculture industry.</p> <p><b>Prerequisite: Aquatic Ecology</b></p>

# MUST-KNOW INFORMATION

## Thesis registration

### Criteria:

- Successfully accumulate at least 90% of credit number of the academic curriculum.
- Do not under any academic admonishment.

**Duration:** 16 weeks

## Graduations

The students have to complete all of the following requirements for graduation:

- Successfully complete the academic curriculum with GPA  $\geq 5.0$
- Meet the minimum English requirement of 500 TOEFL. PBT or its equivalence: 61 TOEFL. IBT, 6.0 IELTS.
- Military education certification
- Meet other requirements in accordance with the regulations for graduation set by the IU

## Scholarship information

Each semester, top 10% of students with highest GPA will receive scholarship from the IU. 4% of students will receive full scholarship (12.000.000 VND / semester) and 6% of students will receive half scholarship (6.000.000 VND / semester).

### The minimum requirements are:

- Register at least 14 credits / semester
- Complete the Academic English 1 (AE1).
- No course is failed in that semester.
- Semester GPA  $\geq 7.0$

## Course registration

Course registration aims at helping students gain full success in building their own training plan, selecting appropriate subjects for every semester in such a way that can meet his or her own personal capacity and conditions for the highest achievement.

- Students should register a minimum of 12 credits, except for the last semester.

- Students should register a maximum of 24 credits in one semester, except for the last semester, for those who have cumulative GPA  $\geq 65$
- The subject registration form must be approved by the academic advisors.
- For exceptional cases, students must file for the consideration of the dean of schools.

### Grading criteria

Classification	Scale 0 to 100	Scale 0 to 4	Letter Grade
<b><i>Pass</i></b>			
<b>Excellent</b>	$85 \leq \text{GPA} \leq 100$	4.0	A
<b>Very good</b>	$75 \leq \text{GPA} < 85$	3.75	A
<b>Good</b>	$65 \leq \text{GPA} < 75$	3.5	B+
<b>Fairly good</b>	$60 \leq \text{GPA} < 65$	3.0	B
<b>Fair</b>	$55 \leq \text{GPA} < 60$	2.5	C+
<b>Average</b>	$50 \leq \text{GPA} < 55$	2.0	C
<b><i>Fail</i></b>			
<b>Weak</b>	$30 \leq \text{GPA} < 50$	1.3	D+
<b>Rather weak</b>	$10 \leq \text{GPA} < 30$	1.0	D
<b>Too weak</b>	$\text{GPA} < 10$	0	F

## POSTGRADUATE

### MASTER OF SCIENCE IN BIOTECHNOLOGY (BY RESEARCH)

The MSc. candidates must complete 45 credits and has at least one public scientific paper to fulfil the requirement for thesis defense.

	Course/ ID/ Credit		Semester
<b>Part 1: Elective Module</b> (minimum 6 credits)	AC1	Genetic Engineering (2,1)	1
	BC2	Molecular Immunology (2,1)	
	BC3	Applied Microbiology (2,1)	
	PC4	Advance Biochemistry (2,1)	
<b>Part 2: Compulsory Module</b> (9 credits)	PC1	Philosophy (4)	2
	PC5	Research Methodology (3)	
	PC6	Special Study (0,2)	
<b>Part 3: Master thesis</b> (30 credits)	Proposal research defense		
	Progress research defense		3
	Thesis writing and defense (30)		4
	<b>Total: 45 credit</b>		

### COURSE DESCRIPTION

#### Genetic Engineering

##### AC1

The subject introduces how to bring basic knowledge of molecular biology to the human life. By using molecular techniques people can modify genetic material of living things to supply more different resources of products support to human life. The course is trying to strike a balance between the methodology and the applications of gene manipulation, which help students can understand the science behind the

	applications and then can apply the technologies to develop or produce other helpful genetically modifying organism.
<b>Molecular Immunology</b> <b>BC2</b>	The course provides the knowledge and practical skills in molecular immunology for master students in order to work in biomedical and pharmaceutical sciences in diagnostic laboratory and research. The course equips the advances in human immunology in both innate and adaptive immune systems. The course refers to application of immunological techniques in diagnostic and research as immunological pathology at macro and molecular levels.
<b>Applied Microbiology</b> <b>BC3</b>	This course aims to equip students with the knowledge and applications of microorganism in various fields, which include pharmaceutical microbiology (bioactive compounds from microbes), microbial biotechnology (genetically modified organisms); industrial microbiology (using microorganisms for improving crop yields and quality, creating insect resistant crops, producing valuable substances/products from agricultural wastes e.g. bio-fertilizers, bio-insecticides, bio-mosquitocides and biofuels, and wastewater treatments using biological method) and food microbiology (fermented products). Students will have a chance to visit some companies producing microbial products and use the obtained knowledge to produce a product of their choices.
<b>Advanced Biochemistry</b> <b>PC4</b>	The course is designed for graduate students with background or interest in biochemistry, pharmacology, molecular biology and undergraduate students who wish to develop a deep understanding of biological processes in living organisms. This course will introduce advanced concepts in enzyme catalytic activities and metabolisms of carbohydrates, fatty acids, amino acids, nucleic acids and proteins with a focus on their biosynthesis. In addition, recent advances in biochemistry, molecular biology and biotechnology will be presented throughout the course.
<b>Research Methodology</b> <b>PC5</b>	Research Methodology is a compulsory course for postgraduate students in biotechnology at IU. The content of the course covers the identification of research problem, hypothesis testing, sampling techniques and experimental design, presentation of research outcomes and manuscript review. The course is delivered in seminar format. Each seminar is a combination of theoretical lectures, group discussion.
<b>Special Study</b> <b>PC6</b>	This course is design to provide students an opportunity to carry out a small project of interest to get familiar with basic lab skills needed for their future thesis research. Students will have to spend about 25 hours in lab per week working on their research and meet up with their advisor at a certain time interval for discussion. Additionally, as a part of the course requirement, students also have to give two presentations on their research topic.



## DOCTOR OF PHILOSOPHY IN BIOTECHNOLOGY

The PhD. candidates must complete 139 credits (not include English requirement) and has public scientific papers to fulfil the requirement for PhD. dissertation's defense.

	Course and ID		
<b>Part 1: Complementary Module</b>	PC5	Research Methodology (3,0)	Select 9 credits
	BC2	Molecular Immunology (2,1)	
	BC3	Applied Microbiology (2,1)	
	PC4	Advanced Biochemistry (2,1)	
	AC1	Genetic Engineering (2,1)	
	BT211IU	Medical Genetics (3,1)	Select 16 credits
	BT213IU	Medical Microbiology (3,1)	
	BT212IU	Stem Cell Biology (3,1)	
	BT214IU	Crop Biotechnology (3,1)	
	BT215IU	Algal Biotechnology (3,1)	
	BT201IU	Techniques in Plant Biotechnology (3,1)	
	BT219U	Drug Design and Simulation (3,1)	
	BC310IU	Pharmaceutical Chemistry (3,1)	
	BT165IU	Process Biotechnology (3,1)	
	FT401IU	Dairy Product Technology (3,1)	
	FT204IU	Food Analysis (3,1)	
	BT177IU	Marine Biotechnology (3,1)	
	BT208IU	Environmental Biotechnology (3,1)	
	AR302IU	Aquaculture Genetics and Selective Breeding (3,1)	
<b>Part 2: Compulsory module</b>	BE2	Applied Bioinformatics (0,2)	
	BE6	Scientific Paper Writing (3,0)	
		Philosophy (4)	
	PH1	Special study 1 (3)	

	PH2	Special study 2 (3)	
	PH3	Literature review (3)	
	PH4	Bioethics (3)	
	PH5	Molecular Cell Biology (3)	
<b>Part 3: PhD. dissertation</b>		<ul style="list-style-type: none"> <li>• Dissertation's proposal (10%)</li> <li>• Dissertation's progress report (20%)</li> <li>• Dissertation's final lecture (20%)</li> <li>• Final thesis defense (50%)</li> </ul>	
		<b>TOTAL: 120 credit</b>	

## COURSE DESCRIPTION

### Applied Bioinformatics BE2

The course is designed specifically for students who have a strong life science background and have already learn the basics of bioinformatics. All key areas of bioinformatics are covered including sequence alignment, gene and promoter prediction, molecular phylogenetics, structural bioinformatics, genomics, and proteomics in advance level. The course will emphasize how computational methods work and compare the strengths and weaknesses of different methods. Technical details of computational algorithms are explained with the use of mathematical formulas in combination with graphical illustrations to aid understanding. It is an ideal course for students wishing to develop their knowledge of bioinformatics to facilitate their own research.

### Scientific Paper Writing BE6

This course is designed to provide international graduate students with necessary skills in writing scientific documents. Students will work toward their goal of becoming independent and skilled writers in their disciplines. Common issues of plagiarism and citation of sources will be brought into attention together with explicit grammar instruction, vocabulary development and critical reading skills. Students will be given the choice of writing directly about their own disciplines since individualized attention will be offered.

### Bioethics PH4

The course provides students guidance to conduct scientific research in accordance with ethical standards. Especially, it enables researchers to find the optimal answer to the difficult ethical questions

appearing in their research related to biotechnology such as genetically modified foods, cloning, etc. The course also helps students to approach issues in medical ethics from many different angles and practical skills. Students must choose one of 8 special topics which are listed in the content of the course to write the final report. Students will need to consult with the lecturer if they want to choose of the topics outside the list.

## **Molecular Cell Biology**

### **PH5**

Modern cell biology is a unifying discipline that combines genetics, biochemistry, and molecular biology with traditional morphological descriptions to study how cells function at the molecular level. This course will introduce students to the dynamic relationship between the structure of cellular organelles and the numerous biochemical reactions that are necessary for cell growth and survival with an emphasis on eukaryotic cells.

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