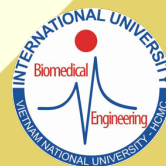


**International University
Vietnam National Universities – Ho Chi Minh City**



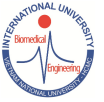
SCHOOL OF BIOMEDICAL ENGINEERING

Undergraduate Program Handout



September 2020

(For Class 2019)



Student name:

Student ID:

Class of:

Academic Advisor:.....

Orientation:

Thesis Advisor:



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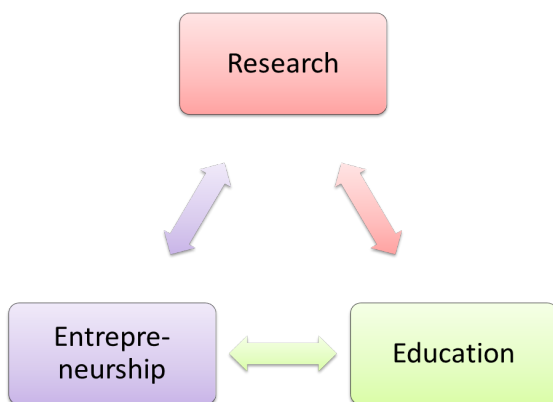
1. INTRODUCTION

What is Biomedical Engineering?

Biomedical engineering is an emerging multidisciplinary field that involves the application of state-of-the-art technology to the creation of methodologies and devices for human welfare and for a better understanding of human biological processes. It includes the study of medical instrumentation, bioinformatics, biomechanics, regenerative medicine and biotechnology, and it requires expertise in applied and basic sciences as well as engineering.

School of Biomedical Engineering (BME)

The BME-IU Department at International University (IU) of Vietnam National Universities in Ho Chi Minh City (VNU-HCM) was created in March 2009 by Professor Võ Văn Tới, Emeritus Professor at Tufts University, USA and a former Executive Director of the Vietnam Education Foundation (VEF), USA. He had been Department Chair until November 2018 when he was promoted to the University Vice-Provost to be in charge of the development of the Life and Health Science, Engineering and Technology for the University. In 2019, the BME Department became the School of BME with the current Dean Associate Professor Nguyễn Thị Hiệp (graduated from SoonChunHyang University, Korea) and the Vice-Dean Dr. Vòng Bình Long (graduated from University of Tsukuba, Japan). Currently, the School of BME has 2 Departments: Department of Medical Instrumentations with the Chair is Dr. Ngô Thanh Hoàn (graduated from Duke University, USA) and Department of Tissue Engineering and Regenerative Medicine with the Chair is Dr. Hà Thị Thanh Hương (graduated from Stanford University, USA).



The vision of the School of BME is to promote integrative **Research, Education** and **Entrepreneurship** at the forefront of biomedical science and engineering.

The motto of our School is: **High quality – Sustainability – Usefulness.**

BME Programs

The School offers the following programs:

1. A 4 year Engineer in Biomedical Engineering (EBME) degree. The first cohort entered in 2010 and up to this point in time more than 190 students have graduated.
2. An undergraduate double degree.
3. A 1.5 year Master of Engineering (ME) degree. The first cohort entered 2013 and up to this point in time near 33 students have graduated.
4. A combined 5 year BS-MS degree.
5. A 3-4 year Ph.D. degree.



Program Educational Objectives

For the graduates of the EBME program, the School aims towards three program educational objectives: Graduates of the program will:

- 1 Independently identify and tackle open-ended biomedical engineering problems to maximize their organizational and social benefits;
- 2 Continuously expand their knowledge, be creative and innovative in their contributions to the field of biomedical engineering;
- 3 Perform, manage, or lead original engineering design and research projects in an ethical and professional manner; carry this out at the highest levels in industry, research laboratories, medical schools, graduate schools, and other public and private sectors.

Student Outcomes:

To realize the Program Educational Objectives, the School targets the following 7 outcomes for BME undergraduate students to achieve by their graduation. The student outcomes of the program follow the guidance recommended by Accreditation Board for Engineering and Technology (ABET) organization in United State for a EBME program and demands of BME in Vietnam:

- 1 An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics;
- 2 An ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors;
- 3 An ability to communicate effectively with a range of audiences;
- 4 An ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts;
- 5 An ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives;
- 6 An ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions;
- 7 An ability to acquire and apply new knowledge as needed, using appropriate learning strategies.

AUN Assessment

In December 2015, the EBME program at IU was accredited by ASEAN University Network Quality Assurance (AUN-QA). This is the first and the only BME program in Vietnam that was accredited by AUN. Further, this program obtained the highest score ever received by any programs in Vietnam that had been assessed by AUN and was placed second in AUN at that time.

AUN is a network of 30 top universities of 10 ASEAN countries. The AUN’s strategic focus built on those identified by ASEAN to facilitate regional cooperation.

ABET Accreditation

The EBME program has been accredited by ABET since October 2017, a recognized United State-based accreditor of college and university programs. ABET accreditation provides assurance that a college or university program meets the quality standards of the profession for which that program prepares



graduates. To date, 4,005 programs at 793 colleges and universities in 32 countries have received ABET accreditation. Students graduated from a program accredited by ABET will be well received by other universities as well as industry not only in the US but also in the world.

Because the EBME program at IU obtained AUN-QA and ABET, EBME graduates have the privilege to be accepted to the BME Master and PhD degree programs with favorite conditions.

2. SCHOOL OF BME PERSONNEL AND LABORATORIES

Administrators

Name	Position	Room
Mr. Võ Văn Tới	Professor, Ph.D, University Vice-Provost	A1.411
Ms. Nguyễn Thị Hiệp	Assoc. Prof., Ph.D., Dean of School	A1.412
Mr. Vòng Bính Long	Ph.D., Vice Dean of School	A1.405
Mr. Ngô Thanh Hoàn	Ph.D., Chair of Dept. of Medical Instrumentation	A1.405
Ms. Hà Thị Thanh Hương	Ph.D., Chair of Dept. of Regenerative Medicine	A1.405
Ms. Ngô Thị Lụa	Ph.D., Student Activity Coordinator	A1. 415
Ms. Trịnh Như Thùy	Ph.D., Research Administrative Coordinator	A1.405
Mr. Nguyễn Thanh Tâm	M.E., Undergraduate Education Coordinator	A1.405
Ms. Từ Thị Tuyết Nga	B.S., Administration Secretary	A1.405
Ms. Nguyễn Thị Hồng Nhung	M.A., General Secretary	A1.405
Ms. Nguyễn Hoàng Thùy Khanh	B.A., Secretary of Education Affairs	A1.405

Faculty

Name	Title	Orientation	Room
Mr. Võ Văn Tới	Ph.D., Professor	Medical Instrumentation	A1. 411
Ms. Nguyễn Thị Hiệp	Ph.D., Assoc. Prof.	Biomaterials, Regenerative Medicine	A1.412
Mr. Vòng Bính Long	Ph.D.	Pharmaceutical Engineering	A1.405
Mr. Ngô Thanh Hoàn	Ph.D.	Medical Instrumentation, Signal and Image Processing	A1.405
Ms. Hà Thị Thanh Hương	Ph.D.	Neuro-Engineering	A1.405
Ms. Phạm Thị Thu Hiền	Ph.D., Assoc. Prof.	Medical Photonics	A1.405
Mr. Huỳnh Chấn Khôn	Ph.D.	Tissue Engineering, Lab-on-a-chip	A1.405
Mr. Trương Phước Long	Ph.D.	Pharmaceutical Engineering	A1.405
Ms. Trịnh Như Thùy	Ph.D.	Stem cell, Regenerative Medicine	A1.405
Ms. Nguyễn Hồng Vân	D.P., Ph.D.	Pharmaceutical Engineering	A1.405
Ms. Ngô Thị Lụa	Ph.D.	Medical Instrumentation	A1.405

Staff

Name	Position	Orientation	Room
Mr. Nguyễn Thanh Tâm	M.E., Chief of Lab	Medical Instrumentation	LA1.404
Mr. Đỗ Minh Thái	M.E., Chief of Lab	Medical Instrumentation	LA1.408
Mr. Trần Ngọc Việt	B.E., Lab Technician	Medical Instrumentation	LA1.408
Mr. Nguyễn Lê Ý	B.E., Lab Technician	Medical Instrumentation	LA1.404
Ms. Nguyễn Hoài Thương	B.E., Teaching Assistant	Signal and Image Processing	LA1.513
Ms. Đặng Ngọc Thảo Nhi	M.E., Lab Technician	Regenerative Medicine	LA1. 406
Ms. Nguyễn Thị Thanh Ngọc	M.S., Lab Technician	Regenerative Medicine	LA1. 406
Ms. Võ Ngọc Hải Châu	Teaching Assistant	Regenerative Medicine	LA1.404
Ms. Nguyễn Thị Phương Nghi	M.S., Lab Technician	Regenerative Medicine	LA1. 406

Laboratories

Name	Person in charge	Location
Medical Photonics	Phạm Thị Thu Hiền	LA1.108
Lab-on-a-chip and Biosensors	Trương Phước Long, Huỳnh Chấn Khôn	LA1.210
R&D Medical Start-up	Nguyễn Thanh Tâm	LA1.404
Tissue Engineering and Regenerative Medicine	Nguyễn Thị Hiệp, Trịnh Như Thùy	LA1.406
Pharmaceutical Engineering	Nguyễn Hồng Vân, Vòng Bính Long	LA1.407
Medical Instrumentation Design	Đỗ Minh Thái, Trần Ngọc Việt	LA1.408
SEM and Cell culture	Nguyễn Thị Hiệp, Trịnh Như Thùy	LA1.413
Clinical Engineering	Ngô Thanh Hoàn, Hà Thị Thanh Hương, Ngô Thị Lụa	LA1.513

3. READ THIS PART BEFORE PERUSING THE REST OF THIS HANDOUT

Complete information of the EBME program is described in detail in the document “BME Academic Curriculum”, disseminated on the School website bme.hcmiu.edu.vn under the menu **Education-Undergraduate**. This present handout summarizes important information of the EBME curriculum to help academic advisors and students to plan and keep track of the student’s progress. It is also disseminated on the same website above. It is edited in a handy format and is very personal. Student must take it alongside at all time, especially when he/she meets and discusses with the academic advisor. This handout is divided into different sections:

1. **BME Undergraduate Course List (page 7-9):** To keep track of the breadth and depth of the program, the courses which have common goals are regrouped into clusters. Each course is listed with its code, the semester it is offered, the courses required before taking it (pre-requisite), its outcomes according to ABET, etc. By perusing this part, students will know of the courses they will take during their 4 years’ study and can plan ahead of time.
2. **Roadmap of BME Curriculum (page 10):** This chart highlights a typical sequential path of the courses of the program semester per semester. This information allows students to picture the relationship among the courses in the timing order. Note that the curriculum is credit based, i.e., students can choose the courses to take for each semester; therefore they can build their own roadmap after consulting their academic advisors. The regular duration of the EBME program is 4 years. It is important to observe this duration. With special permission of IU administration, this time can be extent up to 6 years maximum.
3. **Program Orientations (page 12):** This part lists all orientations of the program and describes their goals, thus allowing students to determine the most interesting one for them.
4. **Learning Schedules (page 13-23):** This chart lists all courses a typical student will take based on the level of English determined at the Placement Test this student took when he/she was admitted to the University such as IE0, IE1, IE2, IE3, and AE1. This allows the students to plan specific courses they have to take semester by semester for the entire 4 years and adjust, if necessary.
5. **BME Undergraduate Program’s Degree Checklist (page 24-25):** This table lists all the courses a student has taken. This is a very important document. Students must keep it updated and show to the academic advisor before they register for courses of the following semester so that the advisor can help students to select appropriate courses according to their progress.
6. **Requirements for graduation and academic awards (page 26):** This part helps students check their fulfilment to all requirements for graduation and conditions for awards.
7. **Advisor’s Comments (page 27):** This part records the advisor’s comments and recommendations to student’s performance for each semester.
8. **Course Descriptions (page 28-36):** This part lists all courses of the program in alphabetical order (based on their codes) and briefly describes their contents.

Note: Information in this handout can be changed. Therefore please check with the secretary of the School or your academic advisor for more updated information.

4. BME UNDERGRADUATE COURSE LIST

The courses in the BME program are regrouped into 8 clusters according to their common goals:

1. Introductory Cluster: to provide students with broad scientific knowledge and engineering tools necessary for most engineers and scientists.
2. Foundation Cluster: to provide students with more advanced tools and knowledge in engineering.
3. Concentration Cluster: to give students specific knowledge in biomedical engineering.
4. Technical Elective Cluster: to allow students to select in-depth courses relating to their interested orientation (see Program Orientation below)
5. Design and Research Cluster: to provide students with practical and advanced tools and knowledge in engineering
6. Humanity, Social Science Cluster: to provide students general knowledge.
7. Free Elective Cluster: to allow students to take courses of their choice in any fields.
8. Academic English Cluster: to allow students to sharpen their English proficiency.

In addition, students are required to take non-academic courses which regroup into 2 following clusters:

1. Political Cluster: to provide students important knowledge of the country political aspects. These courses are exceptionally taught in Vietnamese.
2. Physical Training Cluster: to help students improve their bodies.

Course list of BME Program

Idx	Code	Course name	Credits			LAB
			Total	Lec	Lab	
<i>I</i>	<i>Basic</i>		<i>46</i>	<i>44</i>	<i>2</i>	
	<i>Political and social courses</i>		<i>14</i>	<i>14</i>	<i>0</i>	
1	PE015IU	Triết học Mác-Lênin	3	3	0	-
2	PE016IU	Kinh tế chính trị Mác-Lênin	2	2	0	-
3	PE017IU	Chủ nghĩa Xã hội khoa học	2	2	0	-
4	PE018IU	Lịch sử Đảng Cộng sản Việt Nam	2	2	0	-
5	PE019IU	Tư tưởng Hồ Chí Minh	2	2	0	-
6	PE008IU	Critical Thinking	3	3	0	-
	<i>English courses</i>		<i>8</i>	<i>8</i>	<i>0</i>	
7	EN007IU	Writing AE1	2	2	0	-
8	EN008IU	Listening AE1	2	2	0	-
9	EN011IU	Writing AE2	2	2	0	-
10	EN012IU	Speaking AE2	2	2	0	-
	<i>Calculus – Informatic – Natural Science</i>		<i>24</i>	<i>22</i>	<i>2</i>	
11	MA001IU	Calculus 1	4	4	0	-
12	MA003IU	Calculus 2	4	4	0	-
13	MA023IU	Calculus 3	4	4	0	-
14	MA024IU	Differential Equations	4	3	1	-
15	PH013IU	Physics 1	2	2	0	-
16	PH014IU	Physics 2	2	2	0	-
17	CH011IU	Chemistry for Engineers	3	3	0	-

18	CH012IU	Chemistry Laboratory	1	0	1	BT
	Physical Training		6(0)¹	0	0	
19	PT001IU	Physical Training 1	3(0) ¹	0	3	-
20	PT002IU	Physical Training 2	3(0) ¹	0	3	-
	Military training		Certificate			
II	Foundation courses		36	28	8	
21	BM007IU	Introduction to Biomedical Engineering	4	3	1	LA1.408
22	CH014IU	Chemistry for BME	3	3	0	-
23	BM098IU	Chemistry for BME Laboratory	1	0	1	LA1.407
24	BM090IU	Biology for BME	4	3	1	LA1.406
25	EE051IU	Principles of EE1	3	3	0	-
26	EE052IU	Principles of EE1 Laboratory	1	0	1	LA2.201
27	BM030IU	Machine Design	3	3	0	
28	BM064IU	Applied Informatics	4	3	1	IT
29	BM096IU	AI for Healthcare	3	3	0	IT
30	BM101IU	Mechanical design and manufacturing processes in biomedical engineering	2	2	0	
31	BM102IU	Mechanical design and manufacturing processes in biomedical engineering lab	2	0	2	
32	BM005IU	Statistics for Health Science	3	2	1	-
33	BM091IU	Human Anatomy and Physiology	3	3	0	-
III	Concentration course		50	36	14	
34	BM008IU	Bioethics	3	3	0	
35	BM082IU	Biomaterials	4	3	1	LA1.406
36	BM009IU	BME Capstone Design	4	3	1	LA1.408
37	BM011IU	Engineering Challenges in Medicine I	3	3	0	-
38	BM013IU	Entrepreneurship in Biomedical Engineering	3	3	0	-
39	BM050IU	Lab 1A-Biomedical Instrumentations	1	0	1	LA1.404
40	BM067IU	Lab 1B-Invitro Studies	1	0	1	LA1.404-210
41	BM052IU	Design 2A- Electronic Design	1	0	1	LA1.408
42	BM017IU	Design 2B- Medical Instrumentation	1	0	1	LA1.408
43	BM068IU	Project 1	1	0	1	-
44	BM069IU	Project 2	1	0	1	-
45	BM003IU	Pre-Thesis	1	0	1	-
46		Technical Electives 1 (**)	3	3	0	-
47		Technical Electives 2 (**)	3	3	0	-
48		Technical Electives 3 (**)	4	3	1	-
49		Technical Electives 4 (**)	4	3	1	-
50		Technical Electives 5 (**)	4	3	1	-
51		Technical Electives 6 (**)	4	3	1	-
52		Technical Electives 7 (**)	4	3	1	-
IV	Others		6	6	0	
53		Free Electives (***)	3	3	0	-
24		Free Electives (***)	3	3	0	-
V	Internship, Thesis		13	0	13	
55	BM020IU	Internship	3	0	3	-
56	BM004IU	Thesis	10	0	10	-
	TOTAL		151	-	-	

Notes:

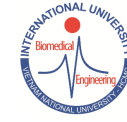
* Course availability depends on several factors. Please check with the secretary of the School and your academic advisor before planning.

** Technical Electives courses show on the list below, students take Technical Electives courses depend on their major.

*** Free Electives can be any courses of any subjects taken anywhere.

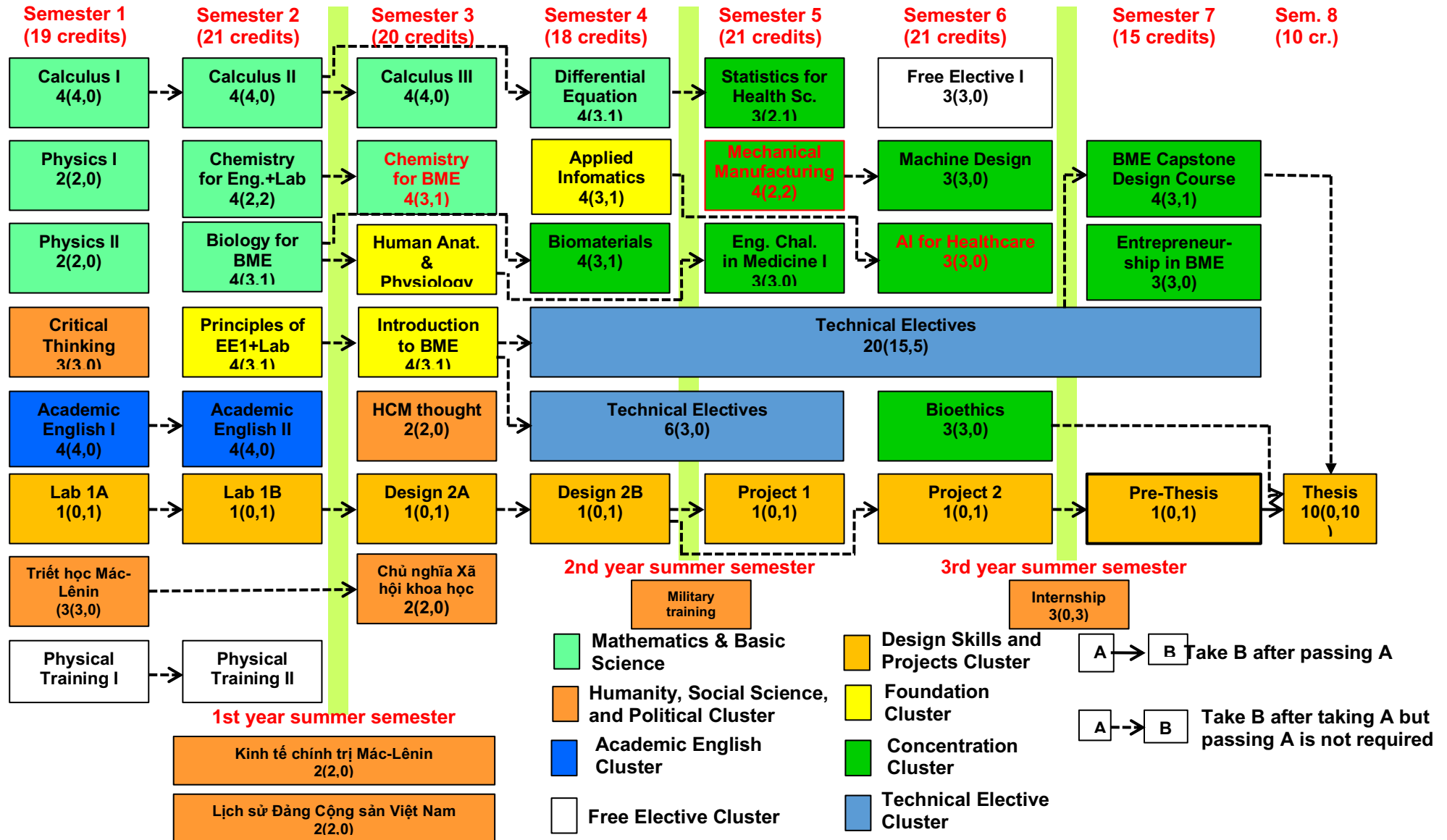
Technical Electives course list

STT	Mã MH	Tên môn học	Credits		
			Σ	LT	TH
1	BM060IU	Digital Systems	3	3	0
2	BM061IU	Digital Systems Lab	1	0	1
3	BM062IU	Micro-electronic Devices	3	3	0
4	BM063IU	Micro-electronic Devices Laboratory	1	0	1
5	BM089IU	Electronic Devices for Biomedical Design	4	3	1
6	BM033IU	Information Technology in the Health Care System	3	3	0
7	BM070IU	Information Technology in the Health Care System Lab	1	0	1
8	BM075IU	Biomedical Photonics	3	3	0
9	BM076IU	Biomedical Photonics Lab	1	0	1
10	BM058IU	Biomedical Image Processing	4	3	1
11	BM072IU	Computational Model in Medicine	4	3	1
12	BM073IU	Medical Imaging	4	3	1
13	BM074IU	Brain - Computer Interface	4	3	1
14	BM071IU	Computer Aided Diagnosis	4	3	1
15	BM077IU	Pharmaceutical Engineering 1	4	3	1
16	BM078IU	Pharmaceutical Engineering 2	4	3	1
17	BM079IU	Principle of Pharmacokinetics	4	3	1
18	BM080IU	Nanotechnology for Drug Delivery Systems	4	3	1
19	BM081IU	Drug Delivery Systems	4	3	1
20	BM010IU	Biosignal Processing	4	3	1
21	BM083IU	Applications of Biomaterials in Regenerative Medicine	4	3	1
22	BM084IU	Biocompatibility and Biodegradation of Biomaterials	4	3	1
23	BM085IU	Characterization and Properties of Biomaterials	4	3	1
24	BM086IU	Methods and Process in Fabrication of Scaffold	4	3	1
25	BM092IU	Cell/Tissue – Biomaterial interaction	4	3	1
26	BM093IU	Tissue engineering I	4	3	1
27	BM094IU	Principle of clinical tests and instrumentation	4	3	1
28	BM012IU	Engineering Challenges in Medicine II	3	3	0
29	PE014IU	Environmental Science	3	3	0
30	BM095IU	Medical Instrumentation	4	3	1
31	BM096IU	Artificial Intelligence in Healthcare	3	3	0
32	BM097IU	Mechanical design and manufacturing processes in BME	4	2	2
33	BM100IU	Principles of Neuroengineering	4	3	1
34	BM099IU	Stem Cell Technology	4	3	1



SCHOOL OF BIOMEDICAL ENGINEERING – IU – VNU
“High Quality – Sustainability – Usefulness”

6. ROADMAP OF BME CURRICULUM



7. PROGRAM ORIENTATIONS

The BME program consists of 5 orientations:

1. **Medical Instrumentation** focusing on the telemedicine, and the design of homecare devices for outpatients and advanced medical equipment providing rapid, automated and reliable diagnostics for healthcare professionals to satisfy the great and urgent needs of the country, and to bring synergy between traditional engineering technologies, the life sciences and medicine.
2. **Biomedical Signal and Image Processing** focusing on the applications of medical devices and developments of new research methodologies and algorithms to investigate human biological processes and provide an early detection of diseases.
3. **Pharmaceutical Engineering** focusing on the investigations of the mechanism of drug delivery using nanotechnology to enhance the efficacy of the treatment of tumors and the imaging diagnostics as well as the development of new drug delivery devices.
4. **Tissue Engineering and Regenerative in Medicine** focusing on the development of new biological and bioinductive materials, and the use of stem cells to repair or replace damaged tissues and organs and to use in biological implants.
5. **Entrepreneurship in Biomedical Engineering** focusing on the developments of clinical engineering and practice of effective methods to bring into the market medical devices newly developed in academic laboratories, to build a medical device industry appropriate for Vietnam and developing countries, and to manage healthcare settings.

Notes:

- a. During the first 2 years all students take the same courses; from the 3rd year students choose their own orientations and take related courses.
- b. For a students, to know which orientation is appropriate for you, discuss with your academic advisor, other faculty members and upper level students. Visit different labs in the School on your own to see what people are doing in there.
- c. In the BME curriculum, Project 1 and Project 2 courses are designed for students to explore the nature of those orientations. These courses are project-based and individual, and taught by instructors of different orientations. Therefore, after taking these courses a student may be able to identify the appropriate orientation and the instructor for the pre-thesis and thesis. These courses can be taken simultaneously in the same semester. However, the topic in each course must be different.
- d. For each orientation, students can take up to 7 courses: 5 technical electives and 2 free elective courses (see BME Undergraduate Course List, page 7-9). These courses will prepare students to do the pre-thesis and thesis works in this orientation. Hence, it is advisable for a student to identify his/her thesis advisor at an early stage. This advisor will then help student identify appropriate courses to be taken.

8. LEARNING SCHEDULES

When a student is first admitted to a program at IU, he/she is required to indicate his/her level of English proficiency. Student can show a proof of an English proficiency exam taken no later than 2 years or take an English placement test administered by IU (Note: this requirement is not applied to students graduated from a high-school whose educational program is in English). Depending on the obtained scores student is placed into one of the following groups:

- AE1 group (TOEFL iBT ≥ 61 or IELTS ≥ 6.0): Student takes Advance English course 1 and courses of EBME program in their 1st semester.
- IE2 group (TOEFL iBT 35-60 or IELTS $\geq 5.0-5.5$): Student takes Intensive English 2 course and some courses of EBME program in the 1st semester.
- IE1 group: (TOEFL iBT ≤ 34 or IELTS ≤ 4.5): Student takes Intensive English 1 course in the 1st semester; and takes Intensive English 2 course and some courses of EBME program in the 2nd semester.

The following tables show the typical roadmaps for students of each group. Note that students of IE2 will catch up with those of AE1 at the 2nd year. IE1 students will graduate one semester later than the students of other groups. Some students may graduate sooner or later than the indicated time. The most important point is that students are encouraged to understand well the contents of the courses they are taking and know how to apply their knowledge in real world.

Table 1: Learning schedule for BME program –AE1 group

Course code	Course name	Credits
1st Semester		
MA001IU	Calculus 1	4
PH013IU	Physics 1 (Mechanics)	2
PH014IU	Physics 2 (Thermodynamics)	2
EN007IU	Writing AE1	2
EN008IU	Listening AE1	2
BM050IU	Lab 1A-Biomedical Instrumentations	1
PE008IU	Critical Thinking	3
PE015IU	Philosophy of Marxism and Leninism	3
PT001IU	Physical Training 1	0(3)*
Credits		19(22)*
Accumulated credits		19
2nd Semester		
MA003IU	Calculus 2	4
CH011IU	Chemistry for Engineers	3
CH012IU	Chemistry Laboratory	1
BM090IU	Biology for BME	4
EN011IU	Writing AE2	2
EN012IU	Speaking AE2	2
BM067IU	Lab 1B-Invitro Studies	1
PE016IU	Political economics of Marxism and Leninism	2
PT002IU	Physical Training 2	0(3)

Credits		19 (22)*
Accumulated credits		38
Summer semester		
PE017IU	Scientific socialism	2
Credits		2
Accumulated credits		40
3rd Semester		
MA023IU	Calculus 3	4
CH014IU	Chemistry for BME	3
BM098IU	Chemistry for BME Lab	1
BM091IU	Human Anatomy and Physiology	3
BM052IU	Design 2A- Electronic Design	1
EE051IU	Principles of EE I	3
EE052IU	Principles of EE I Laboratory	1
PE018IU	History of Vietnamese Communist Party	2
PE019IU	Ho Chi Minh's Thoughts	2
Credits		20
Accumulated credits		60
4th Semester		
BM007IU	Introduction to BME	4
MA024IU	Differential Equations	4
BM064IU	Applied Informatics + Lab	4
BM082IU	Biomaterials	4
_____IU	Technical Electives 1	3
_____IU	Technical Electives 3	4
BM017IU	Design 2B- Medical Instrumentation	1
Credits		24
Accumulated credits		84
Summer semester		
_____IU	Military Training	0
Credits		0
Accumulated credits		84
5th Semester		
BM005IU	Statistics for Health Science	3
BM097IU	Mechanical design and manufacturing processes in biomedical engineering	4
BM011IU	Engineering Challenges in Medicine I	3
_____IU	Technical Electives 2	3
_____IU	Technical Electives 4	4
BM068IU	Project 1	1
Credits		18
Accumulated credits		102
6th Semester		
_____IU	Free Elective 1	3
BM008IU	Bioethics	3
BM030IU	Machine Design	3
BM096IU	AI for healthcare	3
_____IU	Technical Electives 5	4
_____IU	Technical Electives 6	4

BM069IU	Project 2	1
Credits		21
Accumulated credits		123
Summer semester		
BM020IU	Internship	3
Credits		3
Accumulated credits		126
7th Semester		
IU	Free Elective 2	3
BM009IU	BME Capstone Design + Lab	4
BM013IU	Entrepreneurship in Biomedical Engineering	3
BM003IU	Pre-thesis	1
IU	Technical Electives 7	4
Credits		15
Accumulated credits		141
8th Semester		
BM004IU	Thesis	10
Credits		10
Accumulated credits		151
Total credits		151

Table 2: Learning schedule for BME program –IE2 group

Course code	Course name	Credits
1st Semester		
EN074IU	Reading & Writing IE2	8*
EN075IU	Listening & Speaking IE2	8*
MA001IU	Calculus 1	4
BM050IU	Lab 1A-Biomedical Instrumentations	1
PT001IU	Physical Training 1	0(3)*
Credits		5(24)*
Accumulated credits		5
2nd Semester		
MA003IU	Calculus 2	4
PH013IU	Physics 1 (Mechanics)	2
PH014IU	Physics 2 (Thermodynamics)	2
BM090IU	Biology for BME	4
CH011IU	Chemistry for Engineers	3
CH012IU	Chemistry Laboratory	1
EN007IU	Writing AE1	2
EN008IU	Listening AE1	2
BM067IU	Lab 1B-Invitro Studies	1
PT002IU	Physical Training 2	0(3)*
Credits		21(24)*
Accumulated credits		26
Summer semester		
PE015IU	Philosophy of Marxism and Leninism	3
PE016IU	Political economics of Marxism and Leninism	2

Số tín chỉ		5
Số tín chỉ tích lũy đến hết HK		31
3rd Semester		
MA023IU	Calculus 3	4
CH014IU	Chemistry for BME	3
BM098IU	Chemistry for BME Lab	1
EE051IU	Principles of EE I	3
EE052IU	Principles of EE I Laboratory	1
BM091IU	Human Anatomy and Physiology	3
BM052IU	Design 2A- Electronic Design	1
EN011U	Writing AE2	2
EN012IU	Speaking AE2	2
PE017IU	Scientific socialism	2
Credits		22
Accumulated credits		53
4th Semester		
BM007IU	Introduction to BME	4
MA024IU	Differential Equations	4
BM064IU	Applied Informatics + Lab	4
BM082IU	Biomaterials	4
_____IU	Technical Electives 1	3
_____IU	Technical Electives 3	4
BM017IU	Design 2B- Medical Instrumentation	1
Credits		24
Accumulated credits		77
Summer semester		
	Military Training	0
Credits		0
Accumulated credits		77
5th Semester		
BM005IU	Statistics for Health Science	3
BM097IU	Mechanical design and manufacturing processes in biomedical engineering	4
BM011IU	Engineering Challenges in Medicine I	3
PE008IU	Critical Thinking	3
PE018IU	History of Vietnamese Communist Party	2
_____IU	Technical Electives 2	3
_____IU	Technical Electives 4	4
BM068IU	Project 1	1
Credits		23
Accumulated credits		100
6th Semester		
_____IU	Free Elective 1	3
BM008IU	Bioethics	3
BM030IU	Machine Design	3
BM096IU	AI for healthcare	3
PE019IU	Ho Chi Minh's Thoughts	2
_____IU	Technical Electives 5	4
_____IU	Technical Electives 6	4

BM069IU	Project 2	1
Credits		23
Accumulated credits		123
Summer semester		
BM020IU	Internship	3
Credits		3
Accumulated credits		126
7th Semester		
IU	Free Elective 2	3
BM009IU	BME Capstone Design + Lab	4
BM013IU	Entrepreneurship in Biomedical Engineering	3
BM003IU	Pre-thesis	1
IU	Technical Electives 7	4
Credits		15
Accumulated credits		141
8th Semester		
BM004IU	Thesis	10
Credits		10
Accumulated credits		151
Total credits		151

Table 3: Learning schedule for BME program –IE1 group

Course code	Course name	Credits
1st Semester		
EN072IU	Reading & Writing IE1	11*
EN073IU	Listening & Speaking IE1	11*
PT001IU	Physical Training 1	0(3)*
Credits		0(25)*
Accumulated credits		0
2nd Semester		
EN074IU	Reading & Writing IE2	8*
EN075IU	Listening & Speaking IE2	8*
MA001IU	Calculus 1	4
BM050IU	Lab 1A-Biomedical Instrumentations	1
PT002IU	Physical Training 2	0(3)*
Credits		5(24)*
Accumulated credits		5
Summer semester		
PE015IU	Philosophy of Marxism and Leninism	3
PE016IU	Political economics of Marxism and Leninism	2
PH013IU	Physics 1 (Mechanics)	2
Credits		7
Accumulated credits		12
3rd Semester		
EN007IU	Writing AE1	2
EN008IU	Listening AE1	2
MA003IU	Calculus 2	4

CH011IU	Chemistry for Engineers	3
CH012IU	Chemistry Laboratory	1
EE051IU	Principles of EE I	3
EE052IU	Principles of EE I Laboratory	1
BM090IU	Biology for BME	4
PE017IU	Scientific socialism	2
BM067IU	Lab 1B-Invitro Studies	1
Credits		23
Accumulated credits		35
4th Semester		
MA023IU	Calculus 3	4
PH014IU	Physics 2 (Thermodynamics)	2
CH014IU	Chemistry for BME	3
BM098IU	Chemistry for BME Lab	1
BM007IU	Introduction to BME	4
BM091IU	Human Anatomy and Physiology	3
BM052IU	Design 2A- Electronic Design	1
PE018IU	History of Vietnamese Communist Party	2
EN011U	Writing AE2	2
EN012IU	Speaking AE2	2
Credits		24
Accumulated credits		59
Summer semester		
	Military Training	0
Credits		0
Accumulated credits		59
5th Semester		
PE008IU	Critical Thinking	3
MA024IU	Differential Equations	4
BM064IU	Applied Informatics + Lab	4
BM082IU	Biomaterials	4
_____IU	Technical Electives 1	3
_____IU	Technical Electives 3	4
BM017IU	Design 2B- Medical Instrumentation	1
Credits		23
Accumulated credits		82
6th Semester		
BM005IU	Statistics for Health Science	3
BM097IU	Mechanical design and manufacturing processes in biomedical engineering	4
BM011IU	Engineering Challenges in Medicine I	3
_____IU	Technical Electives 2	3
_____IU	Technical Electives 4	4
BM068IU	Project 1	1
PE019IU	Ho Chi Minh's Thoughts	2
Credits		20
Accumulated credits		102
Summer semester		
BM020IU	Internship	3

Credits		3
Accumulated credits		105
7th Semester		
IU	Free Elective 1	3
BM008IU	Bioethics	3
BM030IU	Machine Design	3
BM096IU	AI for healthcare	3
IU	Technical Electives 5	4
IU	Technical Electives 5	4
BM069IU	Project 2	1
Credits		21
Accumulated credits		126
8th Semester		
IU	Free Elective 2	3
BM009IU	BME Capstone Design + Lab	4
BM013IU	Entrepreneurship in Biomedical Engineering	3
BM003IU	Pre-thesis	1
IU	Technical Electives 5	4
Credits		15
Accumulated credits		141
9th Semester		
BM004IU	Thesis	10
Credits		10
Accumulated credits		151
Total credits		151

9. BME UNDERGRADUATE PROGRAM’S DEGREE CHECKLIST

Student name: Student ID:

Academic Advisor: Class of:

Orientation: Thesis Advisor:

Course code	Course name	Credits	Grade
1st Semester			
MA001IU	Calculus 1	4	
PH013IU	Physics 1 (Mechanics)	2	
PH014IU	Physics 2 (Thermodynamics)	2	
EN007IU	Writing AE1	2	
EN008IU	Listening AE1	2	
BM050IU	Lab 1A-Biomedical Instrumentations	1	
PE015IU	Triết học Mác-Lênin	3	
PE016IU	Kinh tế chính trị Mác-Lênin	2	
PT001IU	Physical Training 1	0(3)*	
Credits		18(21)*	
2nd Semester			
MA003IU	Calculus 2	4	
CH011IU	Chemistry for Engineers	3	
CH012IU	Chemistry Laboratory	1	
EE051IU	Principles of EE I	3	
EE052IU	Principles of EE I Laboratory	1	
BM090IU	Biology for BME	4	
EN011IU	Writing AE2	2	
EN012IU	Speaking AE2	2	
BM067IU	Lab 1B-Invitro Studies	1	
PT002IU	Physical Training 2	0(3)	
Credits		21(24)*	
Summer semester			
PE017IU	Chủ nghĩa Xã hội khoa học	2	
PE008IU	Critical Thinking	3	
Credits		5	
3rd Semester			
MA023IU	Calculus 3	4	
CH014IU	Chemistry for BME	3	
BM098IU	Chemistry for BME Lab	1	
BM007IU	Introduction to BME	4	
BM091IU	Human Anatomy and Physiology	3	
BM052IU	Design 2A- Electronic Design	1	
PE018IU	Lịch sử Đảng Cộng sản Việt Nam	2	
PE019IU	Ho Chi Minh's Thoughts	2	
Credits		20	
4th Semester			
MA024IU	Differential Equations	4	
BM064IU	Applied Informatics + Lab	4	
BM082IU	Biomaterials	4	
IU	Technical Electives 1	3	
IU	Technical Electives 3	4	

BM017IU	Design 2B- Medical Instrumentation	1	
Credits		20	
Summer semester			
	Military Training	0	
Credits		0	
5th Semester			
BM005IU	Statistics for Health Science	3	
BM097IU	Mechanical design and manufacturing processes in biomedical engineering	4	
BM011IU	Engineering Challenges in Medicine I	3	
_____IU	Technical Electives 2	3	
_____IU	Technical Electives 4	4	
BM068IU	Project 1	1	
Credits		18	
6th Semester			
_____IU	Free Elective 1	3	
BM008IU	Bioethics	3	
BM030IU	Machine Design	3	
BM096IU	AI for healthcare	3	
_____IU	Technical Electives 5	4	
_____IU	Technical Electives 6	4	
BM069IU	Project 2	1	
Credits		21	
Summer semester			
BM020IU	Internship	3	
Credits		3	
7th Semester			
_____IU	Free Elective 2	3	
BM009IU	BME Capstone Design + Lab	4	
BM013IU	Entrepreneurship in Biomedical Engineering	3	
BM003IU	Pre-thesis	1	
_____IU	Technical Electives 7	4	
Credits		15	
8th Semester			
BM004IU	Thesis	10	
Credits		10	
Accumulated credits		151	

Remarks:

** Free elective can be any courses of any subjects taken anywhere

10. REQUIREMENTS FOR GRADUATION

GRADUATION CHECK LIST

No.	Conditions	Note
1	Had accumulated at least 151 credits of courses including a thesis	
2	Earned a total GPA $\geq 50/100$ points and no course had a grade $< 50/100$	
3	The total time of study for the EBME program is ≤ 6 years	
4	Passed English proficiency with scores of TOEFL iBT ≥ 61 or IELTS ≥ 5.5	
5	Fulfilled Military training requirement	
6	Participated in all 3 civil activities: + Entrance political session + Midterm political session + Exit political session	

DEGREE AWARDS

At the graduation, it depends on the accumulated GPA, a student may receive the following awards:

1. Gold medal: Excellent grade. Note: Only one student/year obtains this award
2. Silver medal: Very Good grade. Note: Only one student/year obtains this award
3. Women Technical Award: for female students with GPA ≥ 80 . There is no limitation of the number of recipients.

Grade level	Grade Point Average (GPA)		
	On 100 points	Letter grades	On 4 points
Excellent	$90 \leq \text{GPA} \leq 100$	A ⁺	4.0
Very Good	$80 \leq \text{GPA} < 90$	A	3.5
Good	$70 \leq \text{GPA} < 80$	B ⁺	3.0
Average Good	$60 \leq \text{GPA} < 70$	B	2.5
Ordinary	$50 \leq \text{GPA} < 60$	C	2

Notes:

To earn the grade level “Excellent” or “Very Good”, a student must not only obtain the required GPA as indicated above but also must satisfy the following conditions; otherwise he/she will be downgraded to one level lower:

- a) The total time until graduation is not higher than the regular requirement (4 years).
- b) If a student re-took the same courses more than once, the total credits of these courses must not be higher than 5% (i.e., 7 credits) of the total of the regular requirements (i.e., 144 credits).
- c) During the study time, the student must not receive an academic punishment of Warning or higher from IU.

11. ADVISOR’S COMMENTS:

Year	Semester	Comments
1 st	1 (Fall)	..... ..... .....
	2 (Spring)	..... ..... .....
2 nd	1 (Fall)	..... ..... .....
	2 (Spring)	..... ..... .....
3 rd	1 (Fall)	..... ..... .....
	2 (Spring)	..... ..... .....
4 th	1 (Fall)	..... ..... .....
	2 (Spring)	..... ..... .....
5 th	1 (Fall)	..... ..... .....
	2 (Spring)	..... ..... .....
6 th	1 (Fall)	..... ..... .....
	2 (Spring)	..... ..... .....

12. COURSE DESCRIPTIONS

BM003IU - Pre-thesis. Credits 1(0,1): From previous experience and knowledge, under the potential thesis advisor supervision, the student will focus on a specific research topic to pave the way and establish a plan for the thesis.

BM004IU - Thesis research. Credits 10(0,10): Student will carry on to the success of the works planned in the pre-thesis course. The final results will be presented in front of a formal examiner panel.

BM005IU - Statistics for health sciences. Credits 3(2,1): This course focuses on intermediate statistical methods which are often used in bioengineering and biomedicine. The course emphasizes the appropriateness, practical application and interpretation of a variety of analytic methods. Working with SPSS (Statistical package for the social sciences) supports student to deal with practical problems in statistical analysis.

BM007IU - Introduction to Biomedical Engineering. Credits 4(3,1): This course consists of three main parts: (1) fundamental engineering technologies and methodologies, (2) their clinical applications and (3) topics related to the department orientations. In the first part students learn different engineering techniques and methods including mathematical modeling and simulation of a dynamic system, design methodology, geometric optics, kinematics, and statistics. In the second part students learn how these techniques or methods are applied in medical field. Case studies focus on specific organs such as eye, ear, and lung. In each study three aspects are covered: physiological, clinical, and instrumentation aspects. These 2 parts emphasize on the activities of the Medical Instrumentation orientation. In the third part other activities of the Department will be briefly introduced including Signal and Image Processing, Pharmaceutical Engineering and Regenerative Medicine. Besides, a semester long project is assigned. The project requires students to conceive, design and build a working device related to Biomedical Engineering field. This course is accompanied by lab works which introduce students by hands-on ways to topics related to different research orientations of the Department.

BM008IU - Bioethics. Credits 3(3,0): Many difficult ethical questions have arisen from the explosive growth of biomedical research and the health-care industry since World War II. For example, when does life begin to matter morally? When and how should doctors be allowed to help patients end their lives? Should embryos be cloned for research and/or reproduction? What sorts of living things is appropriate to use as research subjects? How should we distribute scarce and expensive medical resources? This course will show students how problems in bioethics can be approached from a variety of perspectives, with the aim of understanding how we have got, where we are, and how we should decide where to go next.

BM009IU - BME Capstone Design Course. Credits 4(3,1): The course has three components: class lectures, laboratories, and project. The lectures are built upon all previous BME coursework. They emphasize on the design principles of medical instrumentation and biomedical signal analysis. Topics include the origin of bioelectric potentials; the characteristics of various biological signals, transducers, instrumentation amplifiers, analogue and digital devices; and computer interfaces. Labs include the design, construction and testing of electrical circuits and computer interfaces to measure diverse biological signals. The semester long group project consists of designing an instrument requested from hospitals or the BME Department labs. Students work in a team of different orientations.

BM010IU - Biosignal Processing. Credits 4(3,1): The course provides students fundamentals knowledge to process and analyze biosignals. The knowledge of Fourier transform, signal sampling,

analog to digital conversion, stochastic signal processing are covered in the class. The course also provides insight to different characteristics of typical biological signals including Electrocardiogram (ECG), Electroencephalogram (EEG), Electromyogram (EMG).

BM011IU - Engineering Challenges in Medicine I. Credits 3(3,0): Engineering Challenges in Medicine (ECM) exposes students to technical issues encountered by physicians in hospitals that prevent them to advance in medical diagnosis and treatment. In this course, physician instructors will demonstrate pathophysiology, advantages and disadvantages of current medical management of common diseases, and ask students to propose their own solutions to overcome these challenges. ECM I covers basic principles of diagnostic imaging, electrocardiography and common diseases of the musculoskeletal, neurological, and cardiovascular systems.

BM012IU - Engineering Challenges in Medicine II. Credits 3(3,0): Engineering Challenges in Medicine (ECM) exposes students to technical issues encountered by physicians in hospitals that prevent them to advance in medical diagnosis and treatment. In this course, physician instructors will demonstrate pathophysiology, advantages and disadvantages of current medical management of common diseases, and ask students to propose their own solutions to overcome these challenges. ECM II covers the value of a diagnostic test, interpretation of basic laboratory tests and common diseases of the respiratory, renal, digestive, endocrinal systems, and cancers.

BM013IU - Entrepreneurship in Biomedical Engineering. Credits 3(3,0): This course introduces various stages of the entrepreneurial process and provides knowledge of start-up development. Students will expose to this process by working on some key steps in establishing a start-up for a biomedical product or service. The main goal of the course is to prepare students with an entrepreneurial mindset so that they realize the importance of developing a biomedical product or service that meets the customer demand and can be commercialized.

BM017IU - Design 2B - Medical Instrumentation Design. Credits 1(0,1): Students will explore important software used by engineers to build, analyze, and test the engineering design of a medical instrument. In the first half of the course, student will learn LABVIEW together with medical sensors supported by National Instruments (NI) to develop a prototype of medical devices. In the second half of the course, students will learn SOLIDWORK as a computer-aided design (CAD) tool to help engineers construct a 3-D model of medical devices.

BM020IU - Internship. Credits 3(0,3): Students will work in either companies, hospitals or research institutions in the country or abroad to acquire practical experiences in real world.

BM030IU - Machine Design. Credits 3(3,0): Introduction to the principles of design and analysis of machines and machine components. Design for functionality, motion, force, strength and reliability. The laboratory experience provides open-ended projects to reinforce the design process.

BM033IU, BM070IU - Information Technology in the Health Care System & Laboratory. Credits 4(3,1): This course will teach students how to analyze and apply various management programs and technology systems currently available to health care professionals. Lectures and tutorials will offer experiential learning opportunities. The tutorials will introduce the knowledge and software toolsets that will be used by the students to design an original health care delivery system application. Knowledge will include those used by professionals to design information healthcare system, automated decision support system and healthcare standards.

BM050IU - Lab 1A - Biomedical Instrumentation. Credits 1(0,1): This is the course of general knowledge in medicine and medical instrumentation. Students will learn how to take vital signs, do CPR and some common first aids as well as explore some common medical devices in our

department’s labs such as ECG, Ultrasound, X ray machine... They learn how to use mechanical tools to open these medical devices, disassemble and reassemble them, explore their working principles and block diagrams. As one of the first courses for BME students, it also covers the soft skills required for presentation, literature searching and report writing.

BM052IU - Design 2A - Electronic Design. Credits 1(0,1): Students will study essential skills for medical device design. In the first half of semester, students will study how to design an electrical schematic and PCB using Orcad. They also have chance to make their own PCB using tools in our department’s labs. Upon finishing the third semester, students can design electrical part of a medical device.

BM058IU - Biomedical Image Processing. Credits 4(3,1): The goal of this course is to introduce techniques to enhance biomedical images to help physicians in diagnosis and treatment. This subject also introduces the principle of tomography techniques such as X-ray, CT, MRI and PET/CT. Moreover, it provides students essential knowledge of digital image processing including image acquisition, image formation, linear system, low-level image processing, image enhancement in frequency domain, pattern recognition, etc. A series of exercises and labs also provide students practical experience in working with biomedical image data.

BM060IU, BM061IU - Digital Systems, Digital Systems Lab. Credits 4(3,1): This course provides the student to understand about digital system in order to design digital circuits or systems. This course represents the following parts: Binary arithmetic, Boolean algebra, K-maps, Combinational Logic Circuit, Flip-Flops, Digital Arithmetic, Counters and Registers, Memory Devices, AD-DA Conversions and PLD.

BM062IU - Micro-electronic Devices. Credits 3(3,0): The course is an introduction to microcontrollers including basic architecture, programming and applications of MCS-51 family and other MCS platforms.

BM063IU - Micro-electronic Devices Laboratory. Credits 1(0,1): The course the lab session to apply the knowledge learnt in the in the Micro-electronic Devices class with the focus on basic architecture, programming and applications of MCS-51 family and other MCS platforms.

BM064IU - Applied Informatics. Credits 4(3,1): This course focuses on how to apply programming languages to solve engineering problems targeting towards biomedical fields. C-programming language provides students basic programming skills to develop and implement medical devices. MATLAB-programming language supports effective tools for mathematic calculations and graphical visualization of dataset.

BM067IU - Lab 1B - Invitro Studies. Credits 1(0,1): Students will study existing medical devices such as CT scanner, NIRS, Alice 5, Field Analyser, BIOPAC and others at BME LABs. They learn all blocks of a device and their operation. At the end of the semester, they will represent a poster and give an oral presentation on one of these medical devices.

BM068IU - Project 1. Credits 1(0,1): Students will explore a specific topic in the medical fields. Students will learn how to do a research through various skills of doing experiments, searching and identifying scientific journals as references related to the experiments from e-library, analyzing data, weekly report meeting with advisor, writing scientific report, and etc. At the end of the course, student will submit a final report.

BM069IU - Project 2. Credits 1(0,1): Students will do biomedical engineering project. They will have chance to apply what they have learned in previous semesters in designing, performing

experiment, collecting and analyzing experimental data. In addition, student will improve their presenting, writing skills in scientific manner.

BM071IU - Computer Aided Diagnosis. Credits 4(3,1): This course is an introduction to diagnostic imaging and an overview of how computerized analysis of medical images has been employed to assist physicians in detecting or classifying lesions and screening for differential diagnosis. Topics include typical pathological abnormal patterns of various diagnostic imaging modalities with an emphasis on ECG, Ultrasound, and CT scan. Lab activities focus on interpreting ECG, CT scan and performing an Ultrasound exam.

BM072IU - Computational Model in Medicine. Credits 4(3,1): The computer modeling and simulation of the heart and the circulation, gas exchange in the lungs, control of cell volume, the renal counter-current multiplier mechanism, and muscle mechanics, mechanisms of neural control, genetics, epidemics and dispersal.

BM073IU - Medical Imaging. Credits 4(3,1): Physical and computational principles of different medical imaging modalities (including computed tomography, nuclear, magnetic resonance, ultrasound, and optical imaging) are discussed with the focus on image formulation and reconstruction. Hardware designs and clinical applications are also mentioned.

BM074IU - Brain - Computer Interface. Credits 4(3,1): In this course, students will learn about the basic function and structure of brain, the function of each part of the brain. In addition, students will be practiced on devices to learn how to interface between Brain-Computer. Collecting signals and analyzing them are also mentioned.

BM075IU, BM076IU - Biomedical Photonics & Biomedical Photonics Laboratory. Credits 4(3,1): This course introduces some of the basic concepts of applying light in biomedical applications. This course is especially tailored for engineers who have no prior knowledge in biomedical sciences. The course first introduces some basic concepts in biomedical sciences so that students can be familiar with the techniques and the terminologies used in the field. Subsequently, the course would consider biological tissues as an optical material with some unique properties different from other conventional material, such as semiconductors, when light interacts with it. Several important research topics including microscopy, optical detection techniques, and optical disease detection techniques will be discussed. Engineering students who take this course would allow them to quickly get into the field of biomedical engineering that highly interdisciplinary knowledge and skills are required.

BM077IU - Pharmaceutical Engineering 1. Credits 4(3,1): This course emphasizes the primary engineering aspects of the pharmaceutical processes through methodologies, both applied and fundamental of dosage form design, to analyze and scale up manufacturing pharmaceutical processes involving liquid and dispersed-phase systems including solution, suspensions, transdermal systems, etc.

BM078IU - Pharmaceutical Engineering 2. Credits 4(3,1): This course emphasizes the primary engineering aspects of the pharmaceutical processes through methodologies, both applied and fundamental of dosage form design, to analyze and scale up manufacturing pharmaceutical processes involving solids processing, such as solids characterization, blending, milling, granulation, tableting, coating, and others.

BM079IU - Principle of Pharmacokinetics. Credits 4(3,1): The course is intended to provide the students with basic principles of pharmacokinetics including drug transport, various routes of drug

administration, and drug absorption, distribution, metabolism, and elimination. Mathematical pharmacokinetic models are also presented.

BM080IU - Nanotechnology for Drug Delivery Systems. Credits 4(3,1): Since nanoparticulate drug delivery systems present very small size, they are promising in targeted therapy of diseased tissue, organ and hence, leading to the increased drug concentration at those places through biological barriers to increase the effectiveness of the treatment. The course depicts nanoparticles and technologies applied to targeted drug delivery to diseased cells.

BM081IU - Drug Delivery Systems. Credits 4(3,1): In this class, the students will be introduced the concept of drug delivery systems providing pharmaceutical agents at target site, technology, regulatory considerations and applications of each system. The course is also intended to provide the students about design of controlled release drug delivery systems.

BM082IU - Biomaterials. Credits 4(3,1): An engineer of tissue engineering major should understand biomaterials, and its surface modification for specific applications. Also, an engineer must understand how to choose materials and how to design a scaffold for specific implantation zone.

BM083IU - Applications of Biomaterials in Regenerative Medicine. Credits 4(3,1): This course is the basis for the student in biomedical engineering. It equips students with the basic knowledge about the types of tissues in the human body. This course will introduce some kind of tissue in the human body, including: heart, liver, lungs, stomach, eyes, bones, blood vessels, etc.

BM084IU - Biocompatibility and Biodegradation of Biomaterials. Credits 4(3,1): Students will learn and understand the biocompatible and biodegradable measure of biomaterials. Students will learn and practice in the laboratory about interaction of cells and biomaterials (using MTT, SEM, confocal, etc.) and interaction of implanted biomaterials in animal (using H&E, MT staining).

BM085IU - Characterization and Properties of Biomaterials. Credits 4(3,1): This is a course for students majoring in biological materials. It equips students with the knowledge of how to determine the required properties and characteristics of biomaterials. Case studies and specific applications will be investigated. According to the specific damages to be repaired, the biomaterials must be fabricated to match the required properties and characteristics.

BM086IU - Methods and Process in Fabrication of Scaffold. Credits 4(3,1): This course will introduce students to some common methods to fabricate the biomaterials that are used worldwide. During the course, students will create their own new materials according to their purposes.

BM089IU - Electronic Devices for Biomedical Design. Credits 4(3,1): Fundamentals of semiconductor devices and microelectronic circuits, characteristics of p-n, Zener diodes, and analog diode circuits. Principles of MOSFET and BJT operation, biasing, transistor analysis at midband frequencies.

BM090IU - Biology for BME. Credits 4(3,1): This course covers basic concepts and universal principles of biological molecules, cells, genetics, and biotechnology. The laboratory activities are designed to further investigate and illuminate each topic area in BME research settings.

BM091IU - Human Anatomy and Physiology. Credits 3(3,0): This subject explains the physical and chemical factors that are responsible for the origin, development, and progression of life. This subject explains the specific characteristics and mechanisms of the human body that make it a living

being. This subject explains the functions of tissues, organs and systems with the regulation and control mechanisms of body.

BM092IU - Cell/Tissue – Biomaterial interaction. Credits 4(3,1): A crucial concept to understand about the tissue-biomaterial interface is that a lot of things happen there. The environment inside the body is chemically, electrically, and mechanically active, and the interface between an implanted biomaterial and the body is the location of a variety of dynamic biochemical processes and reactions. This course will introduce students to the molecular level events that happen at the tissue-implant interface, explore selected biological and physiological consequences of these events, methods to characterize interaction between cell/tissue and materials and specifically, design novel biomaterial that truly integrate with the body’s natural tissues.

BM093IU - Tissue engineering I. Credits 4(3,1): Tissue engineering encompasses several disciplinary fields of knowledge to enable the regeneration of malfunctioning tissues or even whole organs. There are three main components in tissue engineering: scaffolds, cells, and signal. This course is the first part of the 2-semester course on Tissue engineering which introduces students to the basic knowledge of those three main components of tissue engineering. The following course (Tissue engineering II) will focus on the clinical applications.

BM094IU - Principle of clinical tests and instrumentation. Credits 4(3,1): The laboratory plays a crucial role in healthcare because it provides physicians and other health professionals with information to: (1) detect disease or predisposition to disease; (2) confirm or reject a diagnosis; (3) establish prognosis; (4) guide patient management; and (5) monitor efficacy of therapy. Therefore, a fundamental understanding of the principles of laboratory tests and instrumentation used in clinical laboratories is essential. This course will provide students an overview of medical laboratory, principle of a wide range of analytical tests and instrumentations ranging from haematology to molecular pathology.

CH011IU - Chemistry for Engineers. Credits 3(3,0): This one-semester course is designed for engineering students those who are pursuing a non-chemistry engineering degree such as information technology, bio-technology, civil, biomedical, electronic and telecommunication engineering. The course will introduce the basic principles of chemistry and connect those principles to issues in engineering professions.

CH012IU - Chemistry Laboratory. Credits 1(0,1): Chemistry Laboratory is an accompanied part for the Chemistry for Engineers, which is designed for engineering students those who are pursuing a non- chemistry engineering degree such as information technology, bio-technology, civil, biomedical, electronic and telecommunication engineering.

CH014IU - Chemistry for BME. Credits 3(3,0): This course is designed for non-chemistry majors, as it is intended for students pursuing a degree in biomedical engineering. The course covers The basic principles of analytical chemistry, introduces modern analytical chemistry and instrumental techniques with emphasis on techniques relevant to analysis in biomedical engineering. Applications of each technique will be discussed.

EE051IU, EE052IU - Principles of EE I, Principles of EE I Laboratory. Credits 4(3,1): In the lectures students study common circuit elements such as resistors, capacitors, inductors, and operational amplifiers, and different circuit analysis methods in DC and AC steady state. In the labs, students practice with Bread-board, Power supply, Signal generator, Multi-meter, Oscilloscope, Multi-sim and Electrical elements.

EN007IU - Writing AE1. Credits 2(2,0): This course provides students with comprehensive instructions and practice in essay writing, including transforming ideas into different functions of writing such as process description, cause-effect, comparison-contrast, argumentative, and paraphrase-summary essays. Throughout the whole course, students are required to read university-level texts to develop the ability to read critically and to respond accurately, coherently and academically in writing. Through providing them with crucial writing skills such as brainstorming, proofreading, documentation and editing, this course prepares the students for research paper writing in the next level of AE2 writing.

EN008IU - Listening AE1. Credits 2(2,0): The course is designed to prepare students for effective listening and note-taking skills, so that they can pursue the courses in their majors without considerable difficulty. The course is therefore lecture-based in that the teaching and learning procedure is built up on lectures on a variety of topics such as business, science, and humanities.

EN011IU - Writing AE2. Credits 2(2,0): This course introduces basic concepts in research paper writing, especially the role of generalizations, definitions, classifications, and the structure of a research paper to students who attend English- medium college or university. It also provides them with methods of developing and presenting an argument, a comparison or a contrast. Students are required to work on the tasks selected to maximize their exposure to written communication and are expected to become competent writers in the particular genre: the research paper. As writing is part of an integrated skill of reading and writing where reading serves as input to trigger writing, this course is designed to familiarize non-native students with academic literature in their major study by having them read and critically respond to texts of a variety of topics ranging from natural sciences such as biology to social sciences and humanities like education, linguistics and psychology.

EN012IU - Speaking AE2. Credits 2(2,0): Giving presentations today becomes a vital skill for students to succeed not only in university but also at work in the future. However, this may be seen as a nerve-racking task, especially when presented in a foreign language. Speaking AE2 provides the students with the knowledge and skills needed to deliver effective presentations. To do this, the course covers many aspects of giving presentation: preparing and planning, using the appropriate language, applying effective visual aids, building up confidence, performing body language, dealing with questions and responding, etc.

MA001IU - Calculus 1. Credits 4(4,0): Functions; Limits; Continuity; Derivatives, Differentiation, Derivatives of Basic Elementary Functions, Differentiation Rules; Applications of Differentiation: l’Hôpital’s Rule, Optimization, Newton’s Method; Anti-derivatives; Indefinite Integrals, Definite Integrals, Fundamental Theorem of Calculus; Techniques of Integration; Improper Integrals; Applications of Integration.

MA003IU - Calculus 2. Credits 4(4,0): Sequence and Series; Convergence Tests; Power Series; Taylor and Maclaurin Series; Cartesian Coordinates; Lines, Planes and Surfaces; Derivatives and Integrals of Vector Functions, Arc Length and Curvature, Parametric Surfaces; Functions of Several Variables; Limits, Continuity, Partial Derivatives, Tangent Planes; Gradient Vectors; Extreme; Lagrange Multipliers; Multiple Integrals: Double Integrals, Triple Integrals, Techniques of Integration; Vector Fields, Line Integrals, Surface Integrals.

MA023IU - Calculus 3. Credits 4(4,0): Complex numbers, complex series, complex functions, complex derivatives; Laplace transform, z-transform, Fourier series, Fourier transform, the inverse transform, transforms of derivatives and integrals, first-order differential equations, second-order differential equations, difference equations, applications to electrical circuits and signal processing.

MA024IU - Differential Equations. Credits 3(3,0): First-order differential equations, second-order linear differential equations, undetermined coefficients, variation of parameters, applications, higher-order linear differential equations, systems of first-order linear equations, elementary partial differential equations and the method of separation of variables.

PE008IU - Critical Thinking. Credits 3(3,0): Critical Thinking studies a process which is indispensable to all educated persons—the process by which we develop and support our beliefs and evaluate the strength of arguments made by others in real-life situations. It includes practice in inductive and deductive reasoning, presentation of arguments in oral and written form, and analysis of the use of language to influence thought. The course also applies the reasoning process to other fields such as business, science, law, social science, ethics, and the arts.

PE011IU - Principles of Marxism. Credits 5(5,0): Ngoài 1 chương mở đầu nhằm giới thiệu khái lược về chủ nghĩa Mác-Lênin và một số vấn đề chung của môn học. Căn cứ vào mục tiêu môn học, nội dung chương trình môn học được cấu trúc thành 3 phần, 9 chương: Phần thứ nhất có 3 chương bao quát những nội dung cơ bản về thế giới quan và phương pháp luận của chủ nghĩa Mác-Lênin; phần thứ hai có 3 chương trình bày ba nội dung trọng tâm thuộc học thuyết kinh tế của chủ nghĩa Mác-Lênin về phương thức sản xuất tư bản chủ nghĩa; phần thứ ba có 3 chương, trong đó có 2 chương khái quát những nội dung cơ bản thuộc lý luận của chủ nghĩa Mác-Lênin về chủ nghĩa xã hội và 1 chương khái quát chủ nghĩa xã hội hiện thực và triển vọng.

PE012IU - Ho Chi Minh's Thoughts. Credits 2(2,0): Ngoài chương mở đầu, nội dung môn học gồm 7 chương: chương 1, trình bày về cơ sở, quá trình hình thành và phát triển tư tưởng Hồ Chí Minh; từ chương 2 đến chương 7 trình bày những nội dung cơ bản của Tư tưởng Hồ Chí Minh theo mục tiêu môn học.

PE013IU - Revolutionary Lines of Vietnamese Communist Party. Credits 3(3,0): Ngoài chương mở đầu, nội dung môn học gồm 8 chương: Chương I: Sự ra đời của Đảng Cộng sản Việt Nam và Cương lĩnh chính trị đầu tiên của Đảng; chương II: Đường lối đấu tranh giành chính quyền (1930-1945); chương III: Đường lối kháng chiến chống thực dân Pháp và đế quốc Mỹ xâm lược (1945-1975); chương IV: Đường lối công nghiệp hoá; chương V: Đường lối xây dựng nền kinh tế thị trường định hướng xã hội chủ nghĩa; chương VI: Đường lối xây dựng hệ thống chính trị; chương VII: Đường lối xây dựng văn hoá và giải quyết các vấn đề xã hội; chương VIII: Đường lối đối ngoại. Nội dung chủ yếu của môn học là cung cấp cho sinh viên những hiểu biết cơ bản có hệ thống về đường lối của Đảng, đặc biệt là đường lối trong thời kỳ đổi mới.

PE014IU - Environmental Science. Credits 3(3,0): 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, environmental economic 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.

PH013IU - Physics 1. Credits 2(2,0): An introduction to mechanics including: planar forces, free body diagrams, planar equilibrium of rigid bodies, friction, distributed forces, internal forces, shear force and bending moment diagrams, simple stress and strain and associated material properties, kinematics and kinetic of particles, work and energy, motion of rigid bodies in a plane.

PH014IU - Physics 2. Credits 2(2,0): This course provides students with basic knowledge of 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.

BM095IU - Medical Instrumentation. Credits 4(3,1): .

BM096IU - Artificial Intelligence in Healthcare. Credits 3(3,0): This course provides an introduction to how we apply artificial intelligence in healthcare. Several typical problems of applied artificial intelligence in healthcare are introduced, such as diagnosis/segmentation/abnormality detection in CT, OCT, fundus, endoscope images, detecting diseases by signals, e.g., EEG, blood pressure, heart rate. The course offers artificial intelligence methods that are frequently utilized in healthcare systems, including k-nearest neighbor, support vector machine (SVM), neural network, convolutional neural network, recurrent neural network, generative adversarial network. There are lab activities in which students work on programing to build practical schemes..

BM097IU - Mechanical design and manufacturing processes in BME. Credits 4(2,2): Introduction and practice of fundamental knowledge and skills of mechanical design and manufacturing processes in biomedical engineering.

BM100IU - Principles of Neuroengineering. Credits 4(3,1): Covers how to innovate technologies for brain analysis and engineering, for accelerating the basic understanding of the brain, and leading to new therapeutic insight and inventions. Focuses on using physical, chemical and biological principles to understand technology design criteria governing ability to observe and alter brain structure and function. Topics include optogenetics, noninvasive brain imaging and stimulation, nanotechnologies, stem cells and tissue engineering, and advanced molecular and structural imaging technologies. Design projects by students.

BM099IU - Stem Cell Technology. Credits 4(3,1): Stem cells, tissue engineering and regenerative medicine are fast moving fields with vastly transformative implications for the future of health care and capital markets. Stem cells, which located in many tissues and organs in human body, are presented as miracle cells that can do anything. When administered to a patient with some serious diseases they will rebuild the damaged tissues and make the patient recover and live longevity. Understanding of stem cell characteristics, intrinsic regulations, and functions helps generating novel therapies for many acute and chronic diseases as well as developing the new strategies for tissue engineering. This course will focus on the science of stem cells to explore the characteristics, functions, pathologies, and applications of stem cells in tissue engineering and regenerative medicine.

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