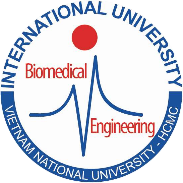
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**International University**



**Undergraduate Program Handout**

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**(Since Oct. 2017)**

**(Since Dec. 2015)**

**September 2023**

**SCHOOL OF**

**BIOMEDICAL ENGINEERING**

**Student name:**

**Student ID:**

**Class of:**

**Orientation:**

**Thesis Advisor:**

**Academic Advisor: Dr. Lê Ngọc Bích**

*lnbich@hcmiu.edu.vn*

**Academic Advisor: Dr. Lê Ngọc Bích**

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[**BM100IU - Principles of Neuroengineering. Credits 4(3,1):** 49](#_Toc145419293)

[**BM101IU - Mechanical Design and Manufacturing Processes in Biomedical Engineering. Credits 2(2,0):** 49](#_Toc145419294)

[**BM102IU - Mechanical Design and Manufacturing Processes in Biomedical Engineering Lab. Credits 2(0,2):** 49](#_Toc145419295)

[**CH011IU - Chemistry for Engineers. Credits 3(3,0):** 49](#_Toc145419296)

[**CH012IU - Chemistry Laboratory. Credits 1(0,1):** 49](#_Toc145419297)

[**CH014IU - Chemistry for BME. Credits 3(3,0):** 49](#_Toc145419298)

[**BM053IU, BM054IU - Principles of EE I, Principles of EE I Laboratory. Credits 4(3,1):** 50](#_Toc145419299)

[**EN007IU - Writing AE1. Credits 2(2,0):** 50](#_Toc145419300)

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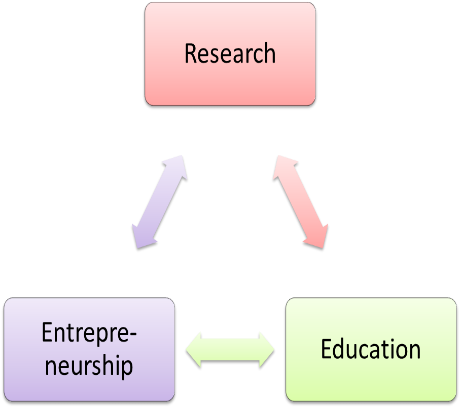
# **INTRODUCTION**

## **1.1. 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.

## **1.2. History of the School of Biomedical Engineering**

The Biomedical Engineering Department at International University (IU) of Vietnam National University 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. The current Dean is Associate Professor Nguyễn Thị Hiệp, graduated from SoonChunHyang University, Korea and the Vice-Dean is Associate Professor Vòng Bính Long, graduated from University of Tsukuba, Japan. School of BME has 2 Departments: Department of Medical Instrumentation (Chair is Associate Professor Phạm Thị Thu Hiền, graduated from National Cheng Kung University, Taiwan) and Department of Tissue Engineering and Regenerative Medicine (Chair is Dr. Hà Thị Thanh Hương, graduated from Stanford University, USA)



The vision of the BME School 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 and usefulness.***

## **1.3. BME Programs**

The School offers the following programs:

1. A 4.5-year Bachelor of Engineering (BE) degree. The first cohort entered in 2010 and up to this point in time more than 230 students have graduated.
2. Multiple undergraduate double degrees with other programs including Biotechnology, Chemistry, Data Science, Information Technology, Electronics and Telecommunication Engineering, and Control and Automation Engineering.
3. A 1.5-year Master of Engineering (ME) degree. The first cohort entered 2013 and up to this point in time, more than 20 students have graduated.
4. A combined 5.5-year Bachelor and Master (BS-MS) degree. The BS-MS program is currently having 25 enrolled students.
5. A 3-4 year Ph.D. degree. The Ph.D. program recruited total 11 students.

## **1.4. Program Educational Objectives**

For the graduates of the Bachelor of Engineering in BME (BE-BME) program, the School aims towards three program educational objectives:

* Be successful in solving problems in a quantitative and systematic fashion, based on biomedical engineering knowledge and multidisciplinary perspectives;
* Continuously expand their knowledge, be creative and innovative in their contributions to the field of biomedical engineering;
* Perform in an ethical and professional manner; carry out this at the highest levels in public and private sectors.

## **1.5. Student Outcomes:**

To realize the Program Educational Objectives, the School targets the following 07 outcomes for BME undergraduate students to achieve by their graduation. The student outcomes of the program follow the guidance recommended by ABET Accreditation Organization for a BE-BME program and demands of BME in Vietnam:

* + 1. **Industry knowledge:**
  1. Outcome 1. an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics. (1.1)
  2. Outcome 6. an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions. (1.2)
     1. **Professional skills and personal qualities:**
  3. Outcome 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. (2.1)
  4. Outcome 7. an ability to acquire and apply new knowledge as needed, using appropriate learning strategies. (2.2)
     1. **Teamwork and communication skills:**
  5. Outcome 3. an ability to communicate effectively with a range of audiences. (3.1)
  6. Outcome 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. (3.2)
     1. **Competency for professional practice:**
  7. Outcome 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 (4.1)

## **1.6. AUN Assessment:**

In December 2015, the BE-BME 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. Furthermore, 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 is built on those identified by ASEAN to facilitate regional cooperation.

## **1.7. ABET Accreditation**

The BE-BME program has been accredited by ABET since October 2017, a recognized U.S.-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. Today, 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 industries not only in the US but also in the world.

Because the BE-BME programs at IU obtained AUN-QA and ABET, BE-BME graduates have the privilege to be accepted to the BME Master’s degree program with favorable conditions.

# **SCHOOL OF BME PERSONNEL AND LABORATORIES**

## **Table 2.1. ADMINISTRATORS**

|  |  |  |
| --- | --- | --- |
| **Name** | **Position** | **Room** |
| Ms. Nguyễn Thị Hiệp | Assoc. Prof., Ph.D., Dean of School | A1.412 |
| Mr. Vòng Bính Long | Assoc. Prof. Ph.D., Vice Dean of School | A1.405 |
| Ms. Phạm Thị Thu Hiền | Assoc. Prof., Ph.D.,  Chair of Dept. of Medical Instrumentation | A1.405 |
| Ms. Hà Thị Thanh Hương | Ph.D., Chair of Dept. of Tissue Engineering and Regenerative Medicine | A1.405 |
| Mr. Lê Ngọc Bích | Ph.D., Research and Graduate Affairs, Academic Advisor of K23 | A1.405 |
| Ms. Nguyễn Tấn Như | Ph.D., Student Activities Affairs | A1.408 |
| Mr. Nguyễn Thành Quả | Ph.D., Head of Laboratories, Dept. Of Medical Instrumentation | A1.405 |
| Mr. Trần Lê Giang | Ph.D., Academic Assistant | LA1.404 |
| Ms. Từ Thị Tuyết Nga | B.S., Administration Secretary | A1.405 |
| Ms. Nguyễn Hoàng Thùy Khanh | B.A., General Secretary | A1.405 |
| Ms. Võ Hồng Phúc | MS., Head of Laboratories, Dept. Of Tissue Engineering and Regenerative Medicine | LA1.404 |

## **Table 2.2. FACULTY**

|  |  |  |  |
| --- | --- | --- | --- |
| **Name** | **Title** | **Orientation** | **Room** |
| Ms. Nguyễn Thị Hiệp | Assoc. Professor | Biomaterials Regenerative Medicine | A1.412 |
| Ms. Phạm Thị Thu Hiền | Assoc. Professor | Medical Photonics | A1.405 |
| Mr. Vòng Bính Long | Assoc. Professor | Pharmaceutical Engineering | A1.405 |
| Mr. Võ Văn Tới | Professor | Founding Falcuty | A1.411 |
| Mr. Huỳnh Chấn Khôn | Ph.D. | Tissue Engineering, Lab-on-a-chip | A1.405 |
| Ms. Hà Thị Thanh Hương | Ph.D. | Neuro-Engineering | A1.405 |
| Mr. Trương Phước Long | PhD. | Lab-on-a-chip | A1.405 |
| Ms. Ngô Thị Lụa | Ph.D. | Signal and Image Processing | A1.405 |
| Mr. Nguyễn Thành Quả | PhD. | Lab-on-a-chip | A1.405 |
| Mr. Lê Ngọc Bích | PhD. | Medical Instrumentation | A1.405 |
| Mr. Trần Lê Giang | Ph.D. | Medical Instrumentation | A1.405 |
| Mr. Đoàn Ngọc Hoan | Ph.D. | Biomaterials | A1.405 |
| Mr. Nguyễn Tấn Như | Ph.D. | AI and Digital Twin for Healthcare | A1.408 |

## **Table 2.3. STAFFS**

|  |  |  |  |
| --- | --- | --- | --- |
| **Name** | **Position** | **Orientation** | **Room** |
| Mr. Nguyễn Lê Ý | M.E., Lab Technician | Medical Instrumentation | LA1.108 |
| 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 |
| Mr. Trần Ngọc Việt | M.E., Lab Technician | Medical Instrumentation | LA1.408 |
| Mrs. Võ Hồng Phúc | MS., Lab Technician | Regenerative Medicine | LA1.404 |
| Ms. Lê Thị Thủy Tiên | B.E., Teaching Assistant | Medical Instrumentation | LA1.408 |
| Mr. Lương Đại Tín | B.E., Teaching Assistant, Lab Technician | Regenerative Medicine | LA1.406 |
| Ms. Phan Thị Thanh Tâm | B.S., Lab Technician | Regenerative Medicine | LA1.404 |
| Ms.Nguyễn Thị Thúy Kiều | M.Sc., Lab Technician | Regenerative Medicine | LA1.404 |
| Ms. Huỳnh Thị Thanh Trúc | B.E., Lab Technician | Medical Instrumentation | LA1.404 |
| Ms. Nguyễn Thị Thu Hà | B.Sc., Lab Technician | Pharmaceutical Engineering | LA1.407 |
| Ms. Lê Trần Mỹ An | B.E., Lab Technician | Regenerative Medicine | LA1.404 |
| Ms. Nguyện Thị Phương Thảo | B.E., Lab Technician | Regenerative Medicine | LA1.404 |

## **Table 2.4. MEDICAL INSTRUMENTATION LABORATORIES**

|  |  |  |
| --- | --- | --- |
| **Name** | **Person in charge** | **Location** |
| Medical Photonics | Phạm Thị Thu Hiền | LA1.108 |
| Lab-on-a-chip and Biosensors | Trương Phước Long | LA1.210 |
| R&D Medical Start-up | Trần Lê Giang | LA1.404 |
| Medical Instrumentation Design | Lê Ngọc Bích | LA1.408 |
| Clinical Engineering | Hà Thị Thanh Hương | LA1.513 |

## **Table 2.5. TISSUE ENGINEERING AND REGENERATIVE MEDICINE LABORATORIES**

|  |  |  |
| --- | --- | --- |
| Tissue Engineering and Regenerative Medicine | Nguyễn Thị Hiệp | LA1.406 |
| Pharmaceutical Engineering | Vòng Bính Long | LA1.407 |
| SEM and Cell culture | Nguyễn Thị Thúy Kiều | LA1.413 |
| Service Equipment | Võ Hồng Phúc | LA1.410A |
| Biochemical Lab | Nguyễn Thị Thanh Ngọc | LA2.413 |
| Animal Lab | Nguyễn Thị Thanh Ngọc | Aqua Lab |
| Microbiology Lab | Phan Thị Thanh Tâm | P109 |
| Production Pilot | Đoàn Ngọc Hoan | P111 |

## **Table 2.6. Council of the School of Biomedical Engineering**

|  |  |
| --- | --- |
| **Name** | **Position** |
| Assoc. Prof., Ph.D., Nguyễn Thị Hiệp | Dean of School, Chair of Council |
| Ph.D., Hà Thị Thanh Hương | Chair of Dept. of Tissue Engineering and Regenerative Medicine. Secretary of Council |
| Assoc. Prof., Ph.D., Vòng Bính Long | Vice Dean of School. Member of Council |
| Professor., Ph.D., Mr. Võ Văn Tới | University Vice-Provost. Member of Council |
| Assoc. Prof., Ph.D., Phạm Thị Thu Hiền | Chair of Dept. of Medical Instrumentation Member of Council |
| Ph.D., Huỳnh Chấn Khôn | Lecturer. Member of Council |
| Ph.D., Ngô Thị Lụa | Lecturer. Member of Council |
| Ph.D., Trịnh Như Thùy | Lecturer. Member of Council |
| Ph.D., Trương Phước Long | Lecturer. Member of Council |
| Ph.D., Nguyễn Thành Quả | Lecturer. Member of Council |
| Ph.D., Lê Ngọc Bích | Lecturer. Member of Council |
| Ph.D., Trần Lê Giang | Lecturer. Member of Council |
| Assoc. Prof., Ph.D., Lê Hoài Quốc | Chairman of Ho Chi Minh City Automation Association. Member of Council |
| Ms. Nguyễn Thị Xuân Nhạn | President of AMPHARCO U.S.A Pharmaceutical Joint Stock Company. Member of Council |

# **3. STUDENT ACTIVITIES AND CLUBS**

The School of Biomedical Engineering has a strong association between academic and student activities. There are plenty of opportunities to attend throughout the year, with students encouraged to get involved in unions and clubs below:

**BME Youth Union**

As an affiliated unit of the International University Youth Union, the purpose of the BME Youth Union is to be a place of solidarity, gathering young people, students, and union members who are working and studying at BME. BME Youth Union is aiming at supporting the School in ideological and moral education through movement activities, and extracurricular activities for students and union members. BME Youth Union is the core force in the development of potential members for the Vietnam Communist Party.

**BME Student Union**

As an affiliated unit of the International University Student Union, the BME Student Union is a close friend of biomedical engineering students during their university life. Every year, BME Student Union organizes a variety of student activities from culture - art, sports, volunteering, academic, and integration through 3 affiliated clubs.

**BME Musketeers**

This is a club belonging to the Student Union of the School of Biomedical Engineering. The club was established to connect the school with alumni, high schools, and companies in the biomedical industry. The regular activities of the club are the organization of academic seminars, student support counseling sessions, and the development of media content.

**BME Innovation Club**

This is a club belonging to the Student Union of the School of Biomedical Engineering. The purpose of the club is to create a playground to encourage students to develop new research projects that society needs in the biomedical field. The BME Innovation Contest is the main activity of the club, combined with technical seminars and especially entrepreneurship skills training sessions.

**BME Sports Club**

This is a club belonging to the Student Union of the School of Biomedical Engineering. The purpose of the club is to create a playground that encourages students to practice sports through practical activities and friendly competitions. Besides, every year the club also organizes competitions for students such as football, basketball, and checkers.

# **READ THIS PART BEFORE PERUSING THE REST OF THIS HANDOUT**

Complete information of the BE-BME 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 about the BE-BME curriculum to help academic advisors and students to plan and keep track of the students’ progress. It is also disseminated on the same website above. It is edited in a handy format and is very personal. Students 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:** 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 the courses they will take during their 4.5 years of study and can plan ahead of time.
2. **Roadmap of BME Curriculum:** 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 BE-BME program is 4.5 years. It is important to observe this duration. With special permission of IU administration, this time can be extended up to 6.5 years maximum.
3. **Program Orientation:** This part lists all orientation of the program and describes their goals, thus allowing students to determine the most interesting one for them.
4. **Learning:** 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 AE1, IE2, IE1, and IE0. This allows the students to plan specific courses they have to take semester by semester for the entire 4.5 years and adjust, if necessary.
5. **BME Undergraduate Program’s Degree Checklist:** 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:** This part helps students check their fulfillment to all requirements for graduation and conditions for awards.
7. **Advisor’s Comments:** This part records the advisor’s comments and recommendations to student’s performance for each semester.
8. **Course Descriptions:** This part lists all courses of the program in an alphabetical order (based on their codes) and briefly describes their contents.

**Note**: The information in this handout can be changed. Therefore, please check with your academic advisor for more updated information.

# **BME UNDERGRADUATE COURSE LIST**

## **Table 5.1: BME Program Checklist for the Class of 2023**

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| No. | Subject ID | Subject | | | | **Subject type** | Credits | | | Laboratory  (\*\*) |
| Vietnamese | | English | | Total | Lecture | Lab |
| **I** | **Basic** | | | | | | ***49*** | ***47*** | ***2*** |  |
| **I.I** | **Political and Social Cluster** | | | | | | ***17*** | ***17*** | ***0*** |  |
| 1 | PE015IU | Triết học Mác-Lênin | Philosophy of Marxism and Leninism | | | Bắt buộc | 3 | 3 | 0 |  |
| 2 | PE016IU | Kinh tế chính trị Mác-Lênin | Political economics of Marxism and Leninism | | | Bắt buộc | 2 | 2 | 0 |  |
| 3 | PE017IU | Chủ nghĩa Xã hội khoa học | Scientific socialism | | | Bắt buộc | 2 | 2 | 0 |  |
| 4 | PE018IU | Lịch sử Đảng Cộng sản Việt Nam | History of Vietnamese Communist Party | | | Bắt buộc | 2 | 2 | 0 |  |
| 5 | PE019IU | Tư tưởng Hồ Chí Minh | Ho Chi Minh's Thoughts | | | Bắt buộc | 2 | 2 | 0 |  |
| 6 | PE008IU | Tư duy phân tích | Critical Thinking | | | Bắt buộc | 3 | 3 | 0 |  |
| 7 | PE021IU | Pháp luật đại cương | General Law | | | Bắt buộc | 3 | 3 | 0 |  |
| **I.II** | **Social Science – Humanity – Art** | | | | | | ***0*** | ***0*** | ***0*** |  |
| **I.III** | **Academic English**  **Cluster** | | | | | | ***8*** | ***8*** | ***0*** |  |
| 8 | EN007IU | Tiếng Anh học thuật 1 - Viết | Writing AE1. | | | Bắt buộc | 2 | 2 | 0 |  |
| 9 | EN008IU | Tiếng Anh học thuật 1 – Nghe | Listening AE1 | | | Bắt buộc | 2 | 2 | 0 |  |
| 10 | EN011IU | Tiếng Anh học thuật 2 - Viết | Writing AE2 | | | Bắt buộc | 2 | 2 | 0 |  |
| 11 | EN012IU | Tiếng Anh học thuật 2 – Nói | Speaking AE2 | | | Bắt buộc | 2 | 2 | 0 |  |
| **I.IV** | **Calculus – Informatic – Natural**  **Science Cluster** | | | | | | ***24*** | ***22*** | ***2*** |  |
| 12 | MA001IU | Toán 1 | Calculus 1 | | | Bắt buộc | 4 | 4 | 0 | - |
| 13 | MA003IU | Toán 2 | Calculus 2 | | | Bắt buộc | 4 | 4 | 0 | - |
| 14 | MA023IU | Toán 3 | Calculus 3 | | | Bắt buộc | 4 | 4 | 0 | - |
| 15 | MA024IU | Phương trình vi phân | Differential Equations | | | Bắt buộc | 4 | 3 | 1 | - |
| 16 | PH013IU | Lý 1 | Physics 1 | | | Bắt buộc | 2 | 2 | 0 | - |
| 17 | PH014IU | Lý 2 | Physics 2 | | | Bắt buộc | 2 | 2 | 0 | - |
| 18 | CH011IU | Hóa học cho kỹ sư | Chemistry for Engineers | | | Bắt buộc | 3 | 3 | 0 | - |
| 19 | CH012IU | Thực hành hóa học | Chemistry Laboratory | | | Bắt buộc | 1 | 0 | 1 | BT |
| **I.V** | **Economics** | | | | | | **0** | **0** | **0** |  |
| **I.VI** | **Physical Training** | | | | | | ***6(0)\**** | ***0*** | ***0*** |  |
| 20 | PT001IU | Giáo dục thể chất 1 | Physical Training 1 | | | Bắt buộc | 3(0)\* | 0 | 3 | - |
| 21 | PT002IU | Giáo dục thể chất 2 | Physical Training 2 | | | Bắt buộc | 3(0)\* | 0 | 3 | - |
| **I.VII** | **Military Training** | | | | | | Certificate | | |  |
| **II** | **Foundation Courses** | | | | |  | ***36*** | ***28*** | ***8*** |  |
| 22 | BM007IU | Kỹ thuật Y sinh đại cương | Introduction to Biomedical Engineering | | | Bắt buộc | 4 | 3 | 1 | LA1.408 |
| 23 | CH014IU | Hóa học cho Kỹ thuật Y Sinh | Chemistry for BME | | | Bắt buộc | 3 | 3 | 0 | - |
| 24 | BM098IU | Thực hành Hóa học cho Kỹ thuật Y Sinh | Chemistry for BME Laboratory | | | Bắt buộc | 1 | 0 | 1 | LA1.407 |
| 25 | BM090IU | Sinh học cho Kỹ Thuật Y Sinh | Biology for BME | | | Bắt buộc | 4 | 3 | 1 | LA1.406 |
| 26 | BM053IU | Nguyên lý điện trong kỹ thuật y sinh | Principles of Electricity in Biomedical Engineering | | | Bắt buộc | 3 | 3 | 0 | - |
| 27 | BM054IU | Thực hành Nguyên lý điện trong kỹ thuật y sinh | Principles of Electricity in Biomedical Engineering Lab | | | Bắt buộc | 1 | 0 | 1 | LA2.201 |
| 28 | BM030IU | Thiết kế máy cơ khí | Machine Design | | | Bắt buộc | 3 | 3 | 0 |  |
| 29 | BM064IU | Tin học ứng dụng | Applied Informatics | | | Bắt buộc | 4 | 3 | 1 | IT |
| 30 | BM096IU | Trí tuệ nhân tạo trong y tế | AI for Healthcare | | | Bắt buộc | 3 | 3 | 0 | LA1.513 |
| 31 | BM101IU | Phương pháp thiết kế và chế tạo cơ khí trong kỹ thuật y sinh | Mechanical design and manufacturing processes in biomedical engineering | | | Bắt buộc | 2 | 2 | 0 | - |
| 32 | BM102IU | Thực hành thiết kế và chế tạo cơ khí trong kỹ thuật y sinh | Mechanical design and manufacturing processes in biomedical engineering Lab | | | Bắt buộc | 2 | 0 | 2 | LA1.404 |
| 33 | BM005IU | Thống kê trong khoa học sức khỏe | Statistics for Health Science | | | Bắt buộc | 3 | 2 | 1 | - |
| 34 | BM091IU | Giải phẫu và sinh lý người | Human Anatomy and Physiology | | | Bắt buộc | 3 | 3 | 0 | - |
| **III** | **Concentration Cluster** | | | | |  | ***45*** | ***36*** | ***9*** |  |
| 35 | BM008IU | Y đức | Bioethics | | | Bắt buộc | 3 | 3 | 0 |  |
| 36 | BM082IU | Vật liệu sinh học | Biomaterials | | | Bắt buộc | 4 | 3 | 1 | LA1.406 |
| 37 | BM009IU | Thiết kế thượng đỉnh trong Kỹ thuật Y Sinh | BME Capstone Design | | | Bắt buộc | 4 | 3 | 1 | LA1.408 |
| 38 | BM011IU | Thách thức kỹ thuật trong Y khoa 1 | Engineering Challenges in Medicine I | | | Bắt buộc | 3 | 3 | 0 | - |
| 39 | BM013IU | Kinh thầu trong Kỹ thuật Y Sinh | Entrepreneurship in Biomedical Engineering | | | Bắt buộc | 3 | 3 | 0 | - |
| 40 | BM068IU | Đồ án 1 | Project 1 | | | Bắt buộc | 1 | 0 | 1 | - |
| 41 | BM003IU | Đồ án chuẩn bị Luận văn tốt nghiệp | Pre-Thesis | | | Bắt buộc | 1 | 0 | 1 | - |
| 42 | BM\_\_\_IU | Môn tự chọn chuyên ngành 1 | Technical Electives 1 (\*\*) | | | Tự chọn | 4 | 3 | 1 | - |
| 43 | BM\_\_\_IU | Môn tự chọn chuyên ngành 2 | Technical Electives 2 (\*\*) | | | Tự chọn | 4 | 3 | 1 | - |
| 44 | BM\_\_\_IU | Môn tự chọn chuyên ngành 3 | Technical Electives 3 (\*\*) | | | Tự chọn | 4 | 3 | 1 | - |
| 45 | BM\_\_\_IU | Môn tự chọn chuyên ngành 4 | Technical Electives 4 (\*\*) | | | Tự chọn | 4 | 3 | 1 | - |
| 46 | BM\_\_\_IU | Môn tự chọn chuyên ngành 5 | Technical Electives 5 (\*\*) | | | Tự chọn | 4 | 3 | 1 | - |
| 47 | BM\_\_\_IU | Môn tự chọn chuyên ngành 6 | Technical Electives 6 (\*\*) | | | Tự chọn | 3 | 3 | 0 | - |
| 48 | BM\_\_\_IU | Môn tự chọn chuyên ngành 7 | Technical Electives 7 (\*\*) | | | Tự chọn | 3 | 3 | 0 | - |
| **IV** | **Free Elective Cluster** | | | | |  | ***3*** | ***3*** | ***0*** |  |
| 49 | \_\_\_\_\_IU | Môn tự chọn | | | Free Electives (\*\*\*) |  | 3 | 3 | 0 |  |
| **V** | **Internship, Thesis** | | | | |  | ***18*** | ***0*** | ***18*** |  |
| 50 | BM050IU | Thực hành 1: Kỹ thuật đảo ngược | | | Practice 1: Reverse Engineering | Bắt buộc | 1 | 0 | 1 | - |
| 51 | BM067IU | Thực hành 2: Tế bào động vật và vi sinh vật | | | Practice 2: Animal Cells and Microbiologies | Bắt buộc | 1 | 0 | 1 | - |
| 52 | BM052IU | Thực hành 3: Thiết kế mạch điện | | | Practice 3: Electronic Design | Bắt buộc | 1 | 0 | 1 | - |
| 53 | BM017IU | Thiết kế y tế | | | Medical Design | Bắt buộc | 1 | 0 | 1 | - |
| 54 | BM069IU | Đồ án 2 | | | Project 2 | Bắt buộc | 1 | 0 | 1 | - |
| 55 | BM020IU | Thực tập | | | Internship | Bắt buộc | 3 | 0 | 3 | - |
| 56 | BM004IU | Luận văn tốt nghiệp | | | Thesis (#) | Bắt buộc | 10 | 0 | 10 |  |
|  | **Tổng số (tín chỉ)** | | | | |  | **151** | **-** | **-** |  |

**\*Note:**

-(\*): Physical Training subject: It has 6 credits but these credits are not included in the total accumulated credits of the undergraduate program.

-(\*\*) Technical Electives courses show on the list below (**Table 5.2**), students take Technical Electives courses to depend on their major.

-(\*\*\*) Free Electives can be any subjects taken by International University. It must have to code subjects “xxxxxIU”.

-(#) You must have to a minimum of 136 accumulated credits and must qualify English output certificate.

The number of credits in math-basic science is 35, engineering is 90, other is 26 (as required by ABET, a minimum number of credits in math-basic science and engineering, respectively are 30 and 45).

## **Table 5.2: List of Technical Electives for Major Orientation**

|  |  |  |
| --- | --- | --- |
| **DEPARTMENT OF REGENERATIVE MEDICINE AND TISSUE ENGINEERING** | | |
| **Technical Elective** | **Tissue Engineering and Regenerative Medicine** | **Pharmaceutical Engineering** |
| **Technical Elective 1** | Methods and Process in Fabrication of Scaffold (BM086IU) | Pharmaceutical Engineering 1 (BM077IU) |
| **Technical Elective 2** | Stem Cell Technology (BM099IU) | Nanotechnology for Drug Delivery Systems (BM080IU) |
| **Technical Elective 3** | Applications of Biomaterials in Regenerative Medicine (BM083IU) | Pharmaceutical Engineering 2 (BM078IU) |
| **Technical Elective 4** | Cell/Tissue - Biomaterial Interaction (BM092IU) | Principle of Pharmacokinetics (BM079IU) |
| **Technical Electives 5,6  (Choose 2 subject in the list** | ● Principles of Clinical Test and Instrumentation (BM094IU)  ●Pharmaceutical Engineering 1 (BM077IU)  ●Nanotechnology for Drug Delivery Systems (BM080IU)  ●Pharmaceutical Engineering 2 (BM078IU)  ●Principle of Pharmacokinetics (BM079IU) | ● Principles of Clinical Test and Instrumentation (BM094IU)  ●Stem Cell Technology (BM099IU)  ●Cell/Tissue - Biomaterial Interaction (BM092IU)  ●Methods and Process in Fabrication of Scaffold (BM086IU)  ●Applications of Biomaterials in Regenerative Medicine (BM083IU)  ●Drug delivery system (BM081IU) |
| **Technical Elective 7** | Can choose any Technical Electives taken by the School of Biomedical Engineering | |
| **DEPARTMENT OF MEDICAL INSTRUMENTATION** | | |
| **Technical Elective** | **Medical Instrumentation** | **Biomedical Signal and Image Processing** |
| **Technical Elective 1** | Electronic Devices for Biomedical Design (BM089IU) | |
| **Technical Elective 2** | Medical Instrumentation (BM095IU) | |
| **Technical Elective 3** | Digital Systems (BM060IU) + Digital Systems Lab (BM061IU) | Biosignal Processing (BM010IU) |
| **Technical Electives 4, 5,6  (choose 3 subjects in the list)** | ● Micro-electronic Devices (BM062IU)  ● Medical Imaging (BM073IU)  ● Biomedical Photonics (BM075IU) + Biomedical Photonics Lab (BM076IU)  ●Information Technology in the Health Care System (BM033IU) + Information Technology in the Health Care System Lab (BM070IU)  ● Principle of Clinical tests and Instrumentation (BM094IU) | **●** Biomedical Image Processing (BM058IU)  ● Computer Aided Diagnosis (BM071IU)  ● Brain - Computer Interface (BM074IU)  ● Principles of Neuroengineering (BM100IU) |
| **Technical Elective 7** | Can choose any Technical Electives taken by the School of Biomedical Engineering | |

*\*Each student following the Orientation of Regenerative Medicine, Pharmaceutical Engineering, Medical Devices, and Biomedical Image Signal Processing needs to accumulate all 7 Technical Electives subjects according to the instructions in the table above.*

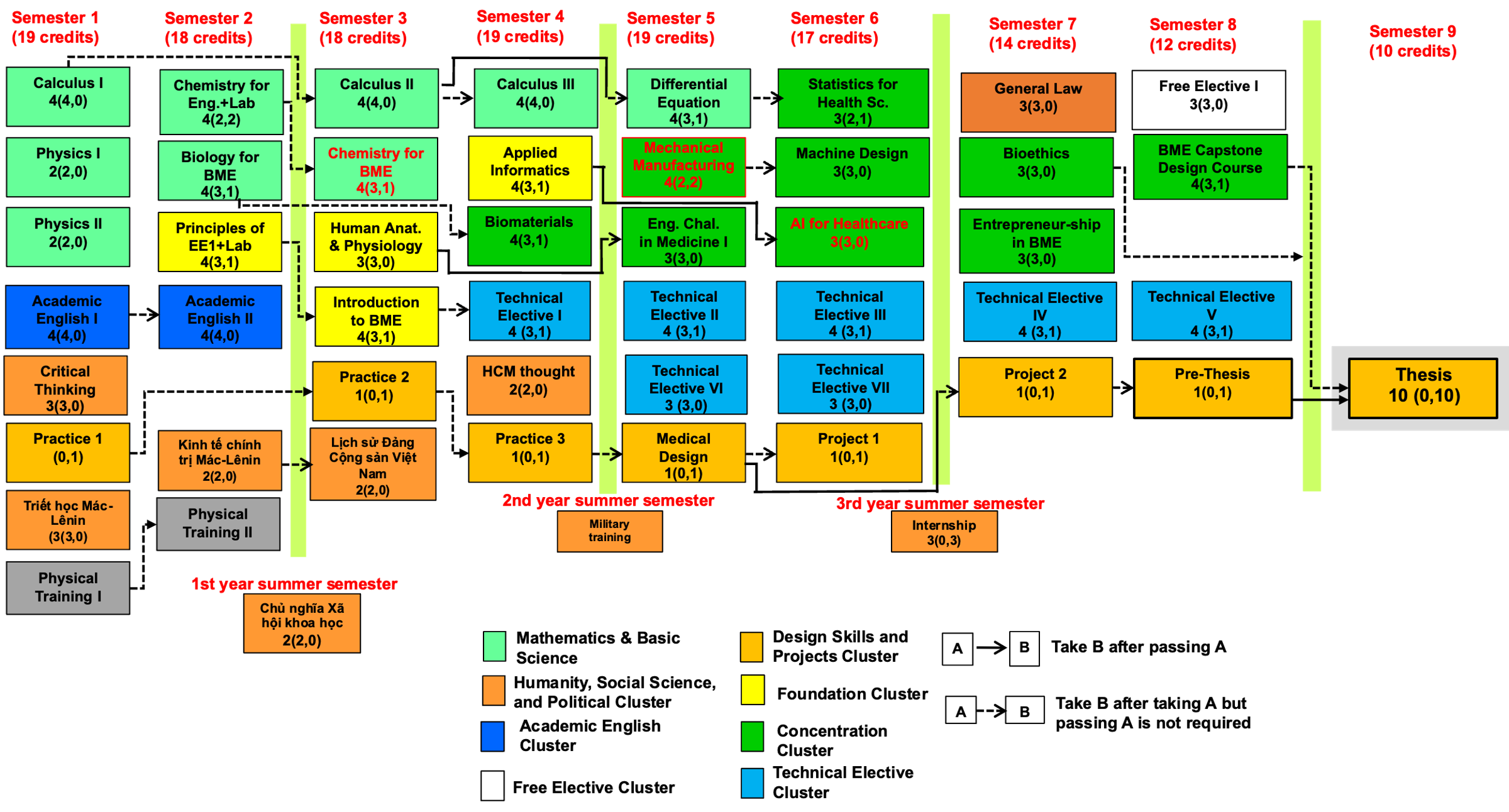
# **YOUR NOTES**

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# **ROADMAP OF BME CURRICULUM FROM THE CLASS OF 2023**



# **PROGRAM ORIENTATION**

The BME program consists of 4 main orientation and

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 and the imaging diagnostics as well as the development of new drug delivery formulations and 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.

and 02 developing orientation:

1. ***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.
2. ***Lab-on-a-chip and Biosensors*** focusing on the design and fabrication of lab-on-a-chip devices and organ-on-a-chip systems in combination with biosensors that are applicable in point-of-care, automatic diagnostics and human-disease models on a chip.

**Notes**:

1. During the first 2 years all students take the same courses; from the 3rd year students choose their own orientation and take related technical elective courses (**Table 5.2**).
2. For a student, to know which orientation is appropriate for you, discuss with your academic advisor, other faculty members and senior students. Visit different labs in the School of Biomedical Engineering on your own to see what people are doing.
3. In the BME curriculum, Project 1 and Project 2 courses are designed for students to explore the nature of those orientation. These courses are project-based and individual, and taught by instructors of different orientation. 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.
4. For each orientation, students can take up to 8 courses: 7 technical electives and 1 free elective course. 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 students identify appropriate courses to be taken.

# **9. 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. Students can show 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 who graduated from high school whose educational program is in English). Depending on the obtained scores a student is placed into one of 4 groups:

* AE1 group: Students take Academic English 1 course and courses of the BE-BME program in their 1st semester.
* IE0, IE1, IE2 group: Students take Intensive English course and begins with the corresponding course (IE0/ IE1/ IE2).

The following tables show the typical roadmaps for students of each group.

## **Table 9.1: Learning schedule for BME program –AE1 group**

|  |  |  |
| --- | --- | --- |
| **Course code** | **Course name** | **Credits** |
| **1st Semester** | | |
| MA001IU | Calculus 1 | 4 |
| PH013IU | Physics 1 | 2 |
| PH014IU | Physics 2 | 2 |
| EN007IU | Writing AE1 | 2 |
| EN008IU | Listening AE1 | 2 |
| BM050IU | Practice 1: Reverse Engineering | 1 |
| PE015IU | Philosophy of Marxism and Leninism | 3 |
| PE008IU | Critical Thinking | 3 |
| PT001IU | Physical Training 1 | 3(0) |
| ***Credits*** | | ***19(22)***\* |
| **Accumulated credits** | | **19** |
| **2nd Semester** | | |
| CH011IU | Chemistry for Engineers | 3 |
| CH012IU | Chemistry Laboratory | 1 |
| BM090IU | Biology for BME | 4 |
| EE051IU | Principles of EE1 | 3 |
| EE052IU | Principles of EE1 Laboratory | 1 |
| EN011IU | Writing AE2 | 2 |
| EN012IU | Speaking AE2 | 2 |
| PE016IU | Political economics of Marxism and Leninism | 2 |
| PT002IU | Physical Training 2 | 3(0)1 |
| ***Credits*** | | ***18(21)***\* |
| **Accumulated credits** | | **37** |
| **Summer semester** | | |
| PE017IU | Scientific socialism | 2 |
| ***Credits*** | | ***2*** |
| **Accumulated credits** | | **39** |
| **3rd Semester** | | |
| MA003IU | Calculus 2 | 4 |
| CH014IU | Chemistry for BME | 3 |
| BM098IU | Chemistry for BME Laboratory | 1 |
| BM091IU | Human Anatomy and Physiology | 3 |
| BM007IU | Introduction to Biomedical Engineering | 4 |
| BM067IU | Practice 2: Animal Cells and Microbiologies | 1 |
| PE018IU | History of Vietnamese Communist Party | 2 |
| ***Credits*** | | ***18*** |
| **Accumulated credits** | | **57** |
| **4th Semester** | | |
| MA023IU | Calculus 3 | 4 |
| BM064IU | Applied Informatics | 4 |
| BM082IU | Biomaterials | 4 |
| BM\_\_\_IU | Technical Electives 1 | 4 |
| PE019IU | Ho Chi Minh's Thoughts | 2 |
| BM052IU | Practice 3: Electronic Design | 1 |
| ***Credits*** | | ***19*** |
| **Accumulated credits** | | **76** |
| **Summer semester** | | |
|  | Military Training | 0 |
| BM102IU | Mechanical design and manufacturing processes in biomedical engineering Lab | 2 |
| ***Credits*** | | ***2*** |
| **Accumulated credits** | | **78** |
| **5th Semester** | | |
| MA024IU | Differential Equations | 4 |
| BM101IU | Mechanical design and manufacturing processes in biomedical engineering | 2 |
| BM011IU | Engineering Challenges in Medicine I | 3 |
| BM017IU | Medical Design | 1 |
| BM\_\_\_IU | Technical Electives 2 | 4 |
| BM\_\_\_IU | Technical Electives 6 | 3 |
| ***Credits*** | | ***17*** |
| **Accumulated credits** | | **95** |
| **6th Semester** | | |
| BM005IU | Statistics for Health Science | 3 |
| BM030IU | Machine Design | 3 |
| BM096IU | AI for Healthcare | 3 |
| BM068IU | Project 1 | 1 |
| BM\_\_\_IU | Technical Electives 3 | 4 |
| BM\_\_\_IU | Technical Electives 7 | 3 |
| ***Credits*** | | ***17*** |
| **Accumulated credits** | | **112** |
| **Summer semester** | | |
| BM020IU | Internship | 3 |
| ***Credits*** | | ***3*** |
| **Accumulated credits** | | **115** |
| **7th Semester** | | |
| BM008IU | Bioethics | 3 |
| BM013IU | Entrepreneurship in Biomedical Engineering | 3 |
| BM\_\_\_IU | Technical Electives 4 | 4 |
| BM069IU | Project 2 | 1 |
| ***Credits*** | | ***11*** |
| **Accumulated credits** | | **126** |
| **8th Semester** | | |
| \_\_\_\_\_IU | Free elective | 3 |
| BM009IU | BME Capstone Design | 4 |
| BM003IU | Pre-Thesis | 1 |
| BM\_\_\_IU | Technical Electives 5 | 4 |
| ***Credits*** | | ***12*** |
| **Accumulated credits** | | **138** |
| **Summer semester** | | |
| PE021IU | General Law | 3 |
| ***Credits*** | | ***3*** |
| **Accumulated credits** | | **141** |
| **9th Semester** | | |
| BM004IU | Thesis | **10** |
| ***Credits*** | | ***10*** |
| **Accumulated credits** | | **151** |
| **Total Credits** | | **151** |

**Note:** \* The IE0/1/2 courses and physical training are not take into account of accumulated credits

## **Table 9.2: Learning schedule for BME program –IE2 group**

|  |  |  |
| --- | --- | --- |
| **Course code** | **Course name** | **Credits** |
| **1st Semester** | | |
| ENTP02 | IE2 | 0(13) |
| MA001IU | Calculus 1 | 4 |
| PT001IU | Physical Training 1 | 0(3) |
| BM050IU | Practice 1: Reverse Engineering | 1 |
| ***Credits*** | | ***5(21)\**** |
| **Accumulated credits** | | **5** |
| **2nd Semester** | | |
| PH013IU | Physics 1 | 2 |
| PH014IU | Physics 2 | 2 |
| EN007IU | Writing AE1. | 2 |
| EN008IU | Listening AE1 | 2 |
| PE015IU | Philosophy of Marxism and Leninism | 3 |
| PE008IU | Critical Thinking | 3 |
| PE016IU | Kinh tế chính trị Mác-Lênin | 2 |
| PT002IU | Physical Training 2 | 3(0)1 |
| ***Credits*** | | ***16*** |
| **Accumulated credits** | | **21** |
| **Summer semester** | | |
| PE017IU | Scientific socialism | 2 |
| ***Credits*** | | ***2*** |
| **Accumulated credits** | | **23** |
| **3rd Semester** | | |
| CH011IU | Chemistry for Engineers | 3 |
| CH012IU | Chemistry Laboratory | 1 |
| BM090IU | Biology for BME | 4 |
| EE051IU | Principles of EE1 | 3 |
| EE052IU | Principles of EE1 Laboratory | 1 |
| EN011IU | Writing AE2 | 2 |
| EN012IU | Speaking AE2 | 2 |
| BM067IU | Practice 2: Animal Cells and Microbiologies | 1 |
| PE018IU | History of Vietnamese Communist Party | 2 |
| ***Credits*** | | ***19*** |
| **Accumulated credits** | | **42** |
| **4th Semester** | | |
| MA003IU | Calculus 2 | 4 |
| CH014IU | Chemistry for BME | 3 |
| BM098IU | Chemistry for BME Laboratory | 1 |
| BM091IU | Human Anatomy and Physiology | 3 |
| BM007IU | Introduction to Biomedical Engineering | 4 |
| PE019IU | Ho Chi Minh's Thoughts | 2 |
| BM052IU | Practice 3: Electronic Design | 1 |
| ***Credits*** | | ***18*** |
| **Accumulated credits** | | **60** |
| **Summer semester** | | |
|  | Military Training | 0 |
| BM102IU | Mechanical design and manufacturing processes in biomedical engineering Lab | 2 |
| ***Credits*** | | ***2*** |
| **Accumulated credits** | | **62** |
| **5th Semester** | | |
| MA023IU | Calculus 3 | 4 |
| BM064IU | Applied Informatics | 4 |
| BM082IU | Biomaterials | 4 |
| BM\_\_\_IU | Technical Electives 1 | 4 |
| BM017IU | Medical Design | 1 |
| BM101IU | Mechanical design and manufacturing processes in biomedical engineering | 2 |
| ***Credits*** | | ***19*** |
| **Accumulated credits** | | **81** |
| **6th Semester** | | |
| MA024IU | Differential Equations | 4 |
| BM011IU | Engineering Challenges in Medicine I | 3 |
| BM\_\_\_IU | Technical Electives 2 | 4 |
| BM\_\_\_IU | Technical Electives 6 | 3 |
| BM068IU | Project 1 | 1 |
| BM005IU | Statistics for Health Science | 3 |
| ***Credits*** | | ***18*** |
| **Accumulated credits** | | **99** |
| **Summer semester** | | |
| BM020IU | Internship | 3 |
| ***Credits*** |  | ***3*** |
| **Accumulated credits** |  | **102** |
| **7th Semester** | | |
| BM030IU | Machine Design | 3 |
| BM096IU | AI for Healthcare | 3 |
| BM\_\_\_IU | Technical Electives 3 | 4 |
| BM\_\_\_IU | Technical Electives 7 | 3 |
| BM069IU | Project 2 | 1 |
| BM008IU | Bioethics | 3 |
| ***Credits*** | | ***17*** |
| **Accumulated credits** | | **119** |
| **8th Semester** | | |
| BM\_\_\_IU | Technical Electives 4 | 4 |
| BM013IU | Entrepreneurship in Biomedical Engineering | 3 |
| \_\_\_\_\_IU | Free elective | 3 |
| BM009IU | BME Capstone Design | 4 |
| BM003IU | Pre-Thesis | 1 |
| BM\_\_\_IU | Technical Electives 5 | 4 |
| ***Credits*** | | ***19*** |
| **Accumulated credits** | | **138** |
| **Summer semester** | | |
| PE021IU | General Law | 3 |
| ***Credits*** | | ***3*** |
| **Accumulated credits** | | **141** |
| **9th Semester** | | |
| BM004IU | Thesis | 10 |
| ***Credits*** |  | ***10*** |
| **Accumulated credits** | | **151** |
| **Total Credits** | | **151** |

**Note:** \* The IE0/1/2 courses and physical training are not take into account of accumulated credits

## **Table 9.3: Learning schedule for BME program –IE1 group**

|  |  |  |
| --- | --- | --- |
| **Course code** | **Course name** | **Credits** |
| **1st Semester** | | |
| ENTP01 | IE1 | 0(17) |
| ENTP02 | IE2 | 0(13) |
| ***Credits*** | | ***0(30)\**** |
| **Accumulated credits** | | **0** |
| **2nd Semester** | | |
| MA001IU | Calculus 1 | 4 |
| PH013IU | Physics 1 | 2 |
| PH014IU | Physics 2 | 2 |
| EN007IU | Writing AE1. | 2 |
| EN008IU | Listening AE1 | 2 |
| BM050IU | Practice 1: Reverse Engineering | 1 |
| PE008IU | Critical Thinking | 3 |
| PT001IU | Physical Training 1 | 3(0) |
| ***Credits*** | | ***16*** |
| **Accumulated credits** | | **16** |
| **Summer semester** | | |
| PE015IU | Philosophy of Marxism and Leninism | 3 |
| PE016IU | Kinh tế chính trị Mác-Lênin | 2 |
| ***Credits*** | | ***5*** |
| **Accumulated credits** | | **21** |
| **3rd semester** | | |
| BM090IU | Biology for BME | 4 |
| CH011IU | Chemistry for Engineers | 3 |
| CH012IU | Chemistry Laboratory | 1 |
| EE051IU | Principles of EE I | 3 |
| EE052IU | Principles of EE I Laboratory | 1 |
| BM067IU | Practice 2: Animal Cells and Microbiologies | 1 |
| PT002IU | Physical Training 2 | 0(3)\* |
| PE017IU | Chủ nghĩa Xã hội khoa học | 2 |
| EN011U | Writing AE2 | 2 |
| EN012IU | Speaking AE2 | 2 |
| ***Credits*** | | ***19*** |
| **Accumulated credits** | | **40** |
| **4th Semester** | | |
| MA003IU | Calculus 2 | 4 |
| BM091IU | Human Anatomy and Physiology | 3 |
| CH014IU | Chemistry for BME | 3 |
| BM098IU | Chemistry for BME Lab | 1 |
| BM007IU | Introduction to BME | 4 |
| BM052IU | Practice 3: Electronic Design | 1 |
| PE018IU | Lịch sử Đảng Cộng sản Việt Nam | 2 |
| ***Credits*** | | ***18*** |
| **Accumulated credits** | | **58** |
| **Summer semester** | | |
|  | Military Training | 0 |
| BM102IU | Mechanical design and manufacturing processes in biomedical engineering Lab | 2 |
| ***Credits*** | | ***2*** |
| **Accumulated credits** | | **60** |
| **5th Semester** | | |
| MA023IU | Calculus 3 | 4 |
| PE019IU | Ho Chi Minh's Thoughts | 2 |
| BM064IU | Applied Informatics + Lab | 4 |
| BM082IU | Biomaterials | 4 |
| BM101IU | Mechanical design and manufacturing processes in biomedical engineering | 2 |
| BM017IU | Medical Design | 1 |
| \_\_\_ \_\_\_IU | Technical Electives 1 | 4 |
| ***Credits*** | | ***21*** |
| **Accumulated credits** | | **81** |
| **6th Semester** | | |
| MA024IU | Differential Equations | 4 |
| BM011IU | Engineering Challenges in Medicine I | 3 |
| BM005IU | Statistics for Health Science | 3 |
| \_\_\_ \_\_\_IU | Technical Electives 3 | 4 |
| BM068IU | Project 1 | 1 |
| \_\_\_ \_\_\_IU | Technical Electives 2 | 4 |
| ***Credits*** | | ***19*** |
| **Accumulated credits** | | **100** |
| **Summer semester** | | |
| BM020IU | Internship | 3 |
| ***Credits*** | | ***3*** |
| **Accumulated credits** | | **103** |
| **7th Semester** | | |
| \_\_\_ \_\_\_IU | Technical Electives 4 | 4 |
| \_\_\_ \_\_\_IU | Technical Electives 5 | 4 |
| BM030IU | Machine Design | 3 |
| BM096IU | AI for healthcare | 3 |
| BM008IU | Bioethics | 3 |
| BM069IU | Project 2 | 1 |
| ***Credits*** | | ***18*** |
| **Accumulated credits** | | **121** |
| **8th Semester** | | |
| BM013IU | Entrepreneurship in Biomedical Engineering | 3 |
| BM009IU | BME Capstone Design + Lab | 4 |
| \_\_\_ \_\_\_IU | Technical Electives 7 | 3 |
| \_\_\_ \_\_\_IU | Free Elective 1 | 3 |
| \_\_\_ \_\_\_IU | Technical Electives 6 | 3 |
| BM003IU | Pre-thesis | 1 |
| ***Credits*** | | ***17*** |
| **Accumulated credits** | | **138** |
| **Summer semester** | | |
| PE021IU | General Law | 3 |
| ***Credits*** |  | ***3*** |
| **Accumulated credits** |  | **141** |
| **9th Semester** | | |
| BM004IU | Thesis | 10 |
| ***Credits*** | | ***10*** |
| **Accumulated credits** | | **151** |
| **Total Credits** | | **151** |

**Note:** \* The IE0/1/2 courses and physical training are not take into account of accumulated credits

## **Table 9.4: Learning schedule for BME program –IE0 group**

|  |  |  |
| --- | --- | --- |
| **Course code** | **Course name** | **Credits** |
| **1st Semester** | | |
| ENTP00 | IE0 | 0(17) |
| ENTP01 | IE1 | 0(17) |
| ***Credits*** | | ***0(34)\**** |
| **Accumulated credits** | | **0** |
| **2nd Semester** | | |
| ENTP02 | IE2 | 0(13) |
| MA001IU | Calculus 1 | 4 |
| PT001IU | Physical Training 1 | 0(3) |
| BM050IU | Practice 1: Reverse Engineering | 1 |
| ***Credits*** |  | ***5(21)\**** |
| **Accumulated credits** | | **5** |
| **Summer semester** | | |
| PE015IU | Triết học Mác-Lênin | 3 |
| PE016IU | Kinh tế chính trị Mác-Lênin | 2 |
| ***Credits*** | | ***5*** |
| **Accumulated credits** | | **10** |
| **3rd Semester** | | |
| PH013IU | Physics 1 | 2 |
| PH014IU | Physics 2 | 2 |
| EN007IU | Writing AE1. | 2 |
| EN008IU | Listening AE1 | 2 |
| PE008IU | Critical Thinking | 3 |
| PT002IU | Physical Training 2 | 3(0)1 |
| MA003IU | Calculus 2 | 4 |
| PE017IU | Chủ nghĩa Xã hội khoa học | 2 |
| BM067IU | Practice 2: Animal Cells and Microbiologies | 1 |
| PE018IU | Lịch sử Đảng Cộng sản Việt Nam | 2 |
| ***Credits*** | | ***20*** |
| **Accumulated credits** | | **30** |
| **4th Semester** | | |
| BM090IU | Biology for BME | ~~4~~ |
| EE051IU | Principles of EE I | 3 |
| EE052IU | Principles of EE I Laboratory | 1 |
| CH011IU | Chemistry for Engineers | 3 |
| CH012IU | Chemistry Laboratory | 1 |
| EN011U | Writing AE2 | 2 |
| EN012IU | Speaking AE2 | 2 |
| MA023IU | Calculus 3 | 4 |
| BM052IU | Practice 3: Electronic Design | 1 |
| ***Credits*** | | ***21*** |
| **Accumulated credits** | | **51** |
| **Summer semester** | | |
|  | Military Training | 0 |
| BM102IU | Mechanical design and manufacturing processes in biomedical engineering Lab | 2 |
| ***Credits*** | | ***2*** |
| **Accumulated credits** | | **53** |
| **5th Semester** | | |
| BM091IU | Human Anatomy and Physiology | 3 |
| BM064IU | Applied Informatics + Lab | 4 |
| BM007IU | Introduction to BME | 4 |
| CH014IU | Chemistry for BME | 3 |
| BM098IU | Chemistry for BME Lab | 1 |
| BM017IU | Medical Design | 1 |
| PE019IU | Ho Chi Minh's Thoughts | 2 |
| BM101IU | Mechanical design and manufacturing processes in biomedical engineering | 2 |
| ***Credits*** | | ***20*** |
| **Accumulated credits** | | **73** |
| **6th Semester** | | |
| \_\_\_ \_\_\_IU | Technical Electives 1 | 4 |
| MA024IU | Differential Equations | 4 |
| BM082IU | Biomaterials | 4 |
| \_\_\_ \_\_\_IU | Technical Electives 3 | 4 |
| BM069IU | Project 2 | 1 |
| BM005IU | Statistics for Health Science | 3 |
| BM068IU | Project 1 | 1 |
| ***Credits*** | | ***21*** |
| **Accumulated credits** |  | **94** |
| **Summer semester** | | |
| BM020IU | Internship | 3 |
| ***Credits*** |  | ***3*** |
| **Accumulated credits** |  | **97** |
| **7th Semester** | | |
| BM008IU | Bioethics | 3 |
| BM011IU | Engineering Challenges in Medicine I | 3 |
| BM030IU | Machine Design | 3 |
| BM096IU | AI for healthcare | 3 |
| \_\_\_ \_\_\_IU | Technical Electives 2 | 4 |
| BM003IU | Pre-thesis | 1 |
| \_\_\_ \_\_\_IU | Technical Electives 6 | 3 |
| ***Credits*** |  | ***20*** |
| **Accumulated credits** |  | **117** |
| **8th Semester** | | |
| BM009IU | BME Capstone Design + Lab | 4 |
| BM013IU | Entrepreneurship in Biomedical Engineering | 3 |
| \_\_\_ \_\_\_IU | Technical Electives 4 | 4 |
| \_\_\_ \_\_\_IU | Technical Electives 5 | 4 |
| \_\_\_ \_\_\_IU | Technical Electives 7 | 3 |
|  |  |  |
| ***Credits*** | | ***18*** |
| **Accumulated credits** |  | **135** |
| **Summer semester** | | |
| PE021IU | General Law | 3 |
| ***Credits*** | | ***3*** |
| **Accumulated credits** | | **138** |
| **9th Semester** | | |
| \_\_\_ \_\_\_IU | Free Elective 1 | 3 |
| BM004IU | Thesis | 10 |
| ***Credits*** | | ***13*** |
| **Accumulated credits** | | **151** |
| **Total credits** |  | **151** |

**Note:** \* The IE0/1/2 courses and physical training are not take into account of accumulated credits

# **10. BME UNDERGRADUATE PROGRAM’S DEGREE CHECKLIST**

|  |  |
| --- | --- |
| Student name: ……………………………… | Student ID: ……………………………… |
| Academic Advisor: ……………………….. | Class of: ………………………………….. |
| Orientation: …………….…………………. | Thesis Advisor: …………………………… |

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **No.** | **Code** | **Course’s name** | | **Credits** | | | **Term** | **Grade** |
| **Total** | **Lect.** | **Lab** |
| ***I*** | ***Basix*** | | | ***49*** | ***47*** | ***2*** |  |  |
| ***I.I*** | ***Political and social* Cluster** | | | ***17*** | ***17*** | ***0*** |  |  |
| 1 | PE015IU | Philosophy of Marxism and Leninism (Triết học Mác-Lênin) | | 3 | 3 | 0 |  |  |
| 2 | PE016IU | Political economics of Marxism and Leninism (Kinh tế chính trị Mác-Lênin) | | 2 | 2 | 0 |  |  |
| 3 | PE017IU | Scientific socialism (Chủ nghĩa Xã hội khoa học) | | 2 | 2 | 0 |  |  |
| 4 | PE018IU | History of Vietnamese Communist Party (Lịch sử Đảng Cộng sản Việt Nam) | | 2 | 2 | 0 |  |  |
| 5 | PE019IU | Ho Chi Minh's Thoughts (Tư tưởng Hồ Chí Minh) | | 2 | 2 | 0 |  |  |
| 6 | PE021IU | General Law (Pháp luật đại cương) | | 3 | 3 | 0 |  |  |
| 7 | PE008IU | Critical Thinking | | 3 | 3 | 0 |  |  |
| ***I.II*** | ***Academic English Cluster*** | | | ***8*** | ***8*** | ***0*** |  |  |
| 8 | EN007IU | Writing AE1 | | 2 | 2 | 0 |  |  |
| 9 | EN008IU | Listening AE1 | | 2 | 2 | 0 |  |  |
| 10 | EN011IU | Writing AE2 | | 2 | 2 | 0 |  |  |
| 11 | EN012IU | Speaking AE2 | | 2 | 2 | 0 |  |  |
| ***I.III*** | ***Calculus – Informatic – Natural Science* Cluster** | | | ***24*** | ***22*** | ***2*** |  |  |
| 12 | MA001IU | | Calculus 1 | 4 | 4 | 0 |  |  |
| 13 | MA003IU | | Calculus 2 | 4 | 4 | 0 |  |  |
| 14 | MA023IU | | Calculus 3 | 4 | 4 | 0 |  |  |
| 15 | MA024IU | | Differential Equations | 4 | 3 | 1 |  |  |
| 16 | PH013IU | | Physics 1 | 2 | 2 | 0 |  |  |
| 17 | PH014IU | | Physics 2 | 2 | 2 | 0 |  |  |
| 18 | CH011IU | | Chemistry for Engineers | 3 | 3 | 0 |  |  |
| 19 | CH012IU | | Chemistry Laboratory | 1 | 0 | 1 |  |  |
| ***I.IV*** | **Physical Training** | | | ***6(0)1*** | ***0*** | ***0*** |  |  |
| 20 | PT001IU | | Physical Training 1 | 3(0)1 | 0 | 3 |  |  |
| 21 | PT002IU | | Physical Training 2 | 3(0)1 | 0 | 3 |  |  |
| ***I.V*** | ***Military Training*** | | | ***Certificate*** | | |  |  |
| ***II*** | ***Foundation courses*** | | | ***36*** | ***28*** | ***8*** |  |  |
| 22 | BM007IU | | Introduction to Biomedical Engineering | 4 | 3 | 1 |  |  |
| 23 | CH014IU | | Chemistry for BME | 3 | 3 | 0 |  |  |
| 24 | BM098IU | | Chemistry for BME Laboratory | 1 | 0 | 1 |  |  |
| 25 | BM090IU | | Biology for BME | 4 | 3 | 1 |  |  |
| 26 | BM053IU | | Principles of Electricity in Biomedical Engineering | 3 | 3 | 0 |  |  |
| 27 | BM054U | | Principles of Electricity in Biomedical Engineering Laboratory | 1 | 0 | 1 |  |  |
| 28 | BM030IU | | Machine Design | 3 | 3 | 0 |  |  |
| 29 | BM064IU | | Applied Informatics | 4 | 3 | 1 |  |  |
| 30 | BM096IU | | AI for Healthcare | 3 | 3 | 0 |  |  |
| 31 | BM101IU | | Mechanical design and manufacturing processes in biomedical engineering | 2 | 2 | 0 |  |  |
| 32 | BM102IU | | Mechanical design and manufacturing processes in biomedical engineering Lab | 2 | 0 | 2 |  |  |
| 33 | BM005IU | | Statistics for Health Science | 3 | 2 | 1 |  |  |
| 34 | BM091IU | | Human Anatomy and Physiology | 3 | 3 | 0 |  |  |
| ***III*** | ***Concentration Cluster*** | | | ***19*** | ***15*** | ***4*** |  |  |
| 35 | BM008IU | | Bioethics | 3 | 3 | 0 |  |  |
| 36 | BM082IU | | Biomaterials | 4 | 3 | 1 |  |  |
| 37 | BM009IU | | BME Capstone Design | 4 | 3 | 1 |  |  |
| 38 | BM011IU | | Engineering Challenges in Medicine I | 3 | 3 | 0 |  |  |
| 39 | BM013IU | | Entrepreneurship in Biomedical Engineering | 3 | 3 | 0 |  |  |
| 40 | BM068IU | | Project 1 | 1 | 0 | 1 |  |  |
| 41 | BM003IU | | Pre-Thesis | 1 | 0 | 1 |  |  |
| ***IV*** | ***Technical Elective Cluster (Need to obtain at least 26 credits)*** | | | ***26*** | ***21*** | ***5*** |  |  |
| 42 |  | | Technical Electives 1:  ……………………………………………………………………………………… | 4 | 3 | 1 |  |  |
| 43 |  | | Technical Electives 2:  ……………………………………………………………………………………… | 4 | 3 | 1 |  |  |
| 44 |  | | Technical Electives 3:  ……………………………………………………………………………………… | 4 | 3 | 1 |  |  |
| 45 |  | | Technical Electives 4:  ……………………………………………………………………………………… | 4 | 3 | 1 |  |  |
| 46 |  | | Technical Electives 5:  ……………………………………………………………………………………… | 4 | 3 | 1 |  |  |
| 47 |  | | Technical Electives 6:  ……………………………………………………………………………………… | 3 | 3 | 0 |  |  |
| 48 |  | | Technical Electives 7:  ……………………………………………………………………………………… | 3 | 3 | 0 |  |  |
| ***VI*** | **Free Elective Cluster** | | | ***3*** | ***3*** | ***0*** |  |  |
| 49 |  | | Free Elective:  ……………………………………………………………………………………… | 3 | 3 | 0 |  |  |
| ***VII*** | ***Internship, Thesis*** | | | ***18*** | ***0*** | ***18*** |  |  |
| 50 | BM020IU | | Internship | 3 | 0 | 3 |  |  |
| 51 | BM050IU | | Practice 1: Reverse Engineering | 1 | 0 | 1 |  |  |
| 52 | BM067IU | | Practice 2: Animal Cells and Microbiologies | 1 | 0 | 1 |  |  |
| 53 | BM052IU | | Practice 3: Electronic Design | 1 | 0 | 1 |  |  |
| 54 | BM017IU | | Medical Design | 1 | 0 | 1 |  |  |
| 55 | BM069IU | | Project 2 | 1 | 0 | 1 |  |  |
| 56 | BM004IU | | Thesis | 10 | 0 | 10 |  |  |
|  |  | | **TỔNG CỘNG** | 151 | - | - |  |  |

# **11. REQUIREMENTS FOR GRADUATION**

## **11.1 GRADUATION CHECKLIST**

|  |  |  |
| --- | --- | --- |
| **No.** | **Conditions** | **Note** |
| 1 | Had accumulated at least 151 credits of courses including a thesis |  |
| 2 | Earned a total GPA ≥ 50/100 points and no course had a grade < 50/100 |  |
| 3 | The total time of study for the BE-BME program is ≤ 6 years |  |
| 4 | Passed English proficiency with scores of TOEFL iBT ≥ 61; or IELTS ≥ 5.5; or TOEIC 600 (Listening + Reading) 270 (Speaking + Writing); or Cambridge Exam (First FCE); or BEC Business Vantage; or BULATS 60 |  |
| 5 | Fulfilled Military training requirement |  |
| 6 | Participated in all 3 civil activities: + Entrance political session  + Midterm political session + Exit political session |  |

## **11.2 DEGREE AWARDS**

Upon graduation, depending 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 ≤ GPA ≤ 100 | A+ | 4.0 |
| Very Good | 80 ≤ GPA < 90 | A | 3.5 |
| Good | 70 ≤ GPA < 80 | B+ | 3.0 |
| Average Good | 60 ≤ GPA < 70 | B | 2.5 |
| Ordinary | 50 ≤ 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:

1. The total time until graduation is not higher than the regular requirement (4 years).
2. If a student retakes 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., 151 credits).
3. During the study time, the student must not receive an academic punition of Warning or higher from IU.

# **12. ADVISOR’S COMMENTS:**

|  |  |  |
| --- | --- | --- |
| **Year** | **Semester** | **Comments** |
| 1st | 1 (Fall) |  |
| 2 (Spring) |  |
| 2nd | 1 (Fall) |  |
| 2 (Spring) |  |
| 3rd | 1 (Fall) |  |
| 2 (Spring) |  |
| 4th | 1 (Fall) |  |
| 2 (Spring) |  |
| 5th | 1 (Fall) |  |
| 2 (Spring) |  |
| 6th | 1 (Fall) |  |
| 2 (Spring) |  |
| 7th | 1 (Fall) |  |

# **13. 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):**

Students 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 students 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 orientation. 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 the medical field. Case studies focus on specific organs such as the eye, ear, and lung. In each study three aspects are covered: physiological, clinical, and instrumentation aspects. These two 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 the Biomedical Engineering field. This course is accompanied by lab works which introduce students by hands-on ways to topics related to different research orientation 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 are 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 projects. 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 orientation.

## **BM010IU - Biosignal Processing. Credits 4(3,1):**

The course provides students with the fundamental knowledge to process and analyze biosignals. The knowledge of Fourier transform, signal sampling, analog to digital conversion, and 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 – Medical 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, students 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 the 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 systems, automated decision support systems and healthcare standards.

## **BM050IU – Practice 1: Reverse Engineering. 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 – Practice 2: Electronic Design. Credits 1(0,1):**

Students will study essential skills for medical device design. In the first half of the semester, students will study how to design an electrical schematic and PCB using Orcad. They also have a chance to make their own PCB using tools in our department’s labs. Upon finishing the third semester, students can design the 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 systems 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 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 mathematical calculations and graphical visualization of dataset.

## **BM067IU – Practice 2: Animal Cells and Microbiologies. 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 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, students will submit a final report.

**BM069IU - Project 2. Credits 1(0,1):**

Students will do biomedical engineering projects. They will have a chance to apply what they have learned in previous semesters in designing, performing experiments, collecting and analyzing experimental data. In addition, students will improve their presenting, writing skills in a 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 the 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 sites, technology, regulatory considerations and applications of each system. The course is also intended to provide the students with the 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 a 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 kinds 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 animals (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 the 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 biomaterials 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 signals. 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 laboratories, principles of a wide range of analytical tests and instrumentations ranging from hematology to molecular pathology.

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

This course covers the basic and advanced principles, concepts, and operations of medical sensors and devices. The origin and nature of measurable physiological signals are studied, including chemical, electrochemical, optical, and electromagnetic signals. The principles and devices to make the measurements, including design of electronic instrumentation, will be rigorously presented. This will be followed by realistic design and experimentation with amplifiers for biopotential measurements. There are laboratories session to give students hands on experience with electronic components, sensors, and biopotential measurements. The final part of this course will cover emerging frontiers of cellular and molecular instrumentation

## **BM096IU - AI for 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

## **BM098IU - Chemistry Laboratory for BME. Credits 1(1,0):**:

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.

## **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.

## **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.

## **BM101IU - Mechanical Design and Manufacturing Processes in Biomedical Engineering. Credits 2(2,0):**

Introduction to fundamental knowledge of mechanical design and manufacturing processes in biomedical engineering.

## **BM102IU - Mechanical Design and Manufacturing Processes in Biomedical Engineering Lab. Credits 2(0,2):**

Learn skills of mechanical design and manufacturing processes in biomedical engineering

## **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.

## **BM053IU, BM054IU - 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.

## **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.

## **PE021IU – General Law. Credits 3(3,0):**

The overarching aims of this course are to: Provide essential knowledge of Vietnamese legal system through integrated technology and real cases for social and cultural sustainability; Raise awareness of responsibility toward others and how to stand for ending all types of legal violations, especially corruption in various social contexts; Practice the necessary skills to act as an ambassador to ensure social fairness and global equitable rights; Use integrated online legal resources and communication tools to help the community to identify issues and develop countermeasures.

# **14. BACHELOR AND MASTER PROGRAM**

The Bachelor-Master (BS-MS) program is an integrated Bachelor – Master degree program allowing students to complete undergraduate and graduate courses within a shorter time frame of 5 years compared to the traditional Bachelor and Master’s programs with 4-year undergraduate and 1.5-2-year graduate modules. Besides, the integrated Bachelor – Master’s degree program encourages and guides students to pursue scientific research path from university level. After accomplishing the BS-MS program, students will obtain two degrees including a Bachelor of Engineering degree and a Master’s degree from International University. When students complete courses in the Master’s curriculum, these courses will be used to consider exemption from courses in the undergraduate university curriculum.

Advantages of the BS-MS program:

* Pursue a Master’s degree in less time in comparison with the traditional Master’s program.
* Reduce tuition costs for the total program.
* Students enrolled in the BS-MS program will be involved in research activities at the early stages.

Eligible candidates: Students in junior or senior year with a GPA ≥ 7.0 (in the scale of 10).

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***SCHOOL OF BIOMEDICAL ENGINEERING***

***INTERNATIONAL UNIVERSITY***

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