Student Guide

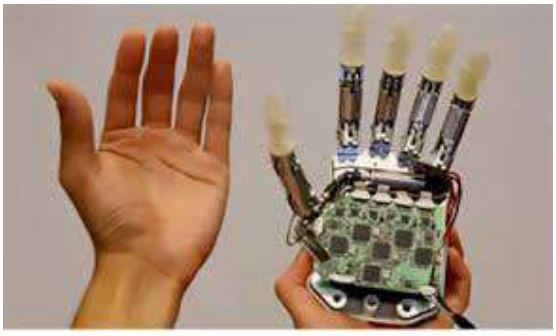
For a Bachelor's Degree

The Biomedical Engineering Program

Credit Hours System

Faculty of Engineering – Mansoura University

2020



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Chapter One

Regulations

First: Introduction

Due to the great scientific development and the collaboration among many majors within one faculty or across many faculties in the university, the university's strategy has headed towards introducing many new programs based on a combination of different majors that adhere to technological changes, scientific development and meet labor market needs. Besides, these programs were designed based on the credit hour system in order to be compatible with National Authority of Quality Assurance and Education Accreditation Standards, the governing standards for an educational product in line with international educational standards, the Academic Standards *NARS2018* and the Engineering Sector Reference Framework 2020 which provides flexibility for learners, and facilitates adopting study plans that correspond to the above mentioned changing attributes.

Second: General Rules

Article [1]: Granting Academic Degrees

Based on Faculty of Engineering Council request, Mansoura University grants a bachelor's degree in one of the following majors:

1. Biomedical Engineering
2. Communication and Computer Engineering
3. Mechatronics Engineering
4. Building and Construction Engineering
5. Chemical and Environmental Engineering
6. Renewable and Sustainable energy Engineering
7. Infrastructure and Environmental Engineering

Students are stipulated to complete the academic requirements necessary for one of these programs to obtain a B.Sc. degree in the required major. Study in these programs should take place in English within each specialization scope based on the credit hour system. Further, students should be aware of the requirements and regulations of each program and should be responsible for achieving them.

Article [2]: The Program Study System

The study system used in these programs is the American system of credit hours within the context of one semester.

Article [3]: The Credit Hour Standard According to the Reference Framework 2020

(A) With regard to theoretical lectures:

One credit hour is calculated for everyone hour per week lecture during one semester.

(B) For practical lessons and practical exercises:

One credit hour is calculated for each 2-3-hour workshop or exercises per semester.

Article [4]: The Academic Council

The Program Management Academic Council shall be formed by a decision from the University President based upon the Faculty Council nomination for two-year-period headed by Faculty Dean and the membership of:

- Vice Dean of Education and Student Affairs.
- Heads of Scientific Departments concerned with the program.
- Program Executive Director.
- Professor or assistant professor from the specialized scientific departments nominated by the Dean after taking the opinion of the Head of the department and it is permissible in special cases to include two lecturers at most to the membership of the council.
- Two experienced members either internal or external.

The academic council of the program will perform all the duties of the faculty scientific departments with respect to education and students' affairs. Further, the academic council shall observe the following criteria with regard to assigning teaching duties to staff members:

- Scientific departments nominations based on their specialty.
- Students' surveys on the previous times the course was taught.
- The program management opinion according to performance evaluation and follow-up.

Article [5]: The Program Executive Director

For each program, an executive director shall be appointed by the University President, after a nomination by the Faculty Dean provided that he is one of the faculty members specialized in the field(s) of the program with associate / full professorship degree, for a minimum of two calendar years, renewable under the same conditions of the first appointment.

The executive director of the program shall perform the following tasks:

- Implementing the program's internal regulation.
- Coordination between the scientific departments in assigning teaching duties to faculty members.
- Supervising students' academic registration.
- Supervising the administrative work by the program staff.
- Supervising the regularity of academic counseling in the program.
- Following up the educational process regularity in accordance with the approved study schedules.
- Supervising and regulating end-of-term and mid-term exams (if any).
- Supervising field training and forming partnerships with distinguished training authorities.
- Carrying out the secretariat of the council in the subcommittee of the academic council.
- Organizing and supervising the program scientific conference.
- Preparing the forms related to the financial duties in the program and submitting them to the higher management of the college.
- Overseeing the development of the program's infrastructure, including runways, lecture halls, exercise halls, school laboratories and equipment.
- Supervising the fulfillment of all quality assurance requirements in accordance with the standards of the National Authority for Accreditation and Quality Assurance of Education.
- Preparing the annual self-study for the program to be presented to the Project Management Unit in the Ministry of Higher Education and Scientific Research.

Article [6]: Programs Coordinator for Digital Transformation

A programs coordinator for digital transformation is appointed by the Dean of the faculty after a nomination by the Faculty Vice Dean of student affairs (if three or more programs are available in the faculty) from the (associate) professors at the

faculty having experience working with the credit hours' system and the programs for a period of two years' renewable with the same conditions of the first appointment.

The programs coordinator for digital transformation duties are:

- Reviewing and auditing student registrations for all programs after approval of the relevant councils.
- Reviewing the control works and fulfilling the final control stages after approval of the relevant councils.
- Supervising the financial page follow-up for program students.
- Reviewing the quality assurance work in the programs.

Article [7]: Registration Requirements and Entry Requirements

The student's registration for the bachelor's degree in these programs is required in addition to the general conditions stipulated in the executive regulations (Article 75) of the Universities Organizing Law as follows:

- The student meets the admission requirements determined by the Supreme Council of Universities.
- The student must have a high school completion certificate or its equivalent where major is in Mathematics.
- The student fulfills the internal rules approved by the Faculty Board regarding the admission of students to these programs.

Article [8]: Transfer Conditions (change of course) and Re-enrollment

If the transfer is within the faculty, the transfer can occur before the start of the main semesters via approved rules by the faculty council and applied by the faculty representative for education and students affairs; while if the transfer is from another faculty within the university or from another university, the transfer is only through the central remittance office. At the beginning of the academic year, a student budget is made according to Table (1).

Table (1): The Symbol and Grade Corresponding to Assessment Obtained Degree by the Student when Converting from the Semester System to the Credit Hour System.

The percentage obtained by the student	Number of points	Estimate
Less than 50% (Failed)	00.0	F
40% to less than 50% (successful by clemency rules)	1.00	D
50% to less than 55%	1.00	D
55% to less than 60%	1.30	D+
60% to less than 65%	1.70	C-
65% to less than 68%	2.00	C
68% to less than 71%	2.30	C-
71% to less than 75%	2.70	B+
75% to less than 80%	3.00	B
80% to less than 85%	3.30	B+
85% to less than 90%	3.70	A-
90% to less than 95%	4.00	A
95% to 100%	4.00	A+

- Transferring students who wish to enroll in one of the accredited programs specializations must have completed level (000) courses with an average grade of no less than 2,00 (maximum grade 4,00), and according to the rules determined by the faculty council and approved by the university council, based on the available capacity of the program.
- Students who are transferred from the regular stream may be admitted to the same faculty, according to conditions determined by the Faculty Council and approved by the University Council based on the program's available capacity.
- Students who have already spent two years in five years studying colleges outside of Faculty of Engineering, Mansoura University, and wish to join the program should submit a case statement from the faculty in which they were enrolled stating the degrees they have obtained and whether they have obtained credit hours or not.
- It is permissible to accept international students who have obtained a high school diploma or its equivalent in every academic year according to the order of their degrees according to the nominations received by the Faculty from the General Administration of International Students. Then, the faculty council undertakes a proposal in exchange for the cost of educational services other than the university fees prescribed for these students.

- Students, who have previously left studying in the program for a period of up to four semesters at a maximum and who have already received high estimates in the period they spent, may re-register for the program if they wish to do so, after the approval of the relevant academic council and in accordance with the rules for regular study [11].

Article [9]: Obtaining the Degree Requirements

In order for the student to obtain a bachelor's degree in the aforementioned programs, Article [1]:

- The student must successfully pass at least (160 credit hours).
- The student must pass the graduation project.
- The student must pass courses where the evaluation is Pass / Fail and does not count towards the student GPA such as summer training.
- The distribution of subjects that are included in the study program for graduation requirements should be as follows:

Table (2)

Specialized Groups	Min %	Max%
University Requirements	8%	-
Faculty Requirements	20%	-
General Major Requirements	35%	-
Accurate Specialization Requirements	-	28%

Taking into account that the academic plans for each program achieve the courses and the indicative proportions set by the National Authority for Quality Assurance of Education, which includes the following curricula:

- Social and Human Sciences
- Business Administration
- Mathematics and Basic Sciences
- Engineering culture
- Basic Engineering Sciences
- Engineering and design applications
- Project and field training

Article [10] Scientific Departments Participating in the Credit Hour Programs Implementation

The academic council supervises, for each program, teaching of all the courses of the subprograms that follow it, including humanities, Arabic language and technical reports. The scientific departments assign teaching duties of the various courses after being approved by the faculty council. Teaching should be conducted through the following scientific departments, each in the scope of its major:

- Electronics and Communications Engineering Department.
- Computer Engineering and Control Systems Department.
- Production Engineering and Mechanical Design Department.
- power mechanical engineering Department.
- Mathematics and Engineering Physics Department.
- Structural Engineering Department - Public Works Department - Irrigation
- and Hydraulics Department.
- Architecture Department.
- External departments in the field of anatomy, physiology and public health from the Faculty of Medicine.
- External departments in the field of organic chemistry, biochemistry, Microbiology and Pharmaceutical procedures from Faculty of Pharmacy.
- External departments in the field of languages - Faculty of Education or Faculty of Arts – English Major.
- External departments of the Faculty of Commerce in the field of management and marketing.
- External departments of the Faculty of Law in the field of legislation and administration laws.

The academic council of the program administration approves the faculty members nominated by the concerned departments, and these nominations are presented to the faculty council for approval such that the language of study for all courses is English.

Article [11]: Study Duration and its Dates

The duration of the study in the program is ten main semesters for all students, and the student may finish studying the program in nine semesters (when the student has successfully passed 160 credit hours). The academic year is

divided into two main semesters, each ending with an exam, according to the content stated in the curriculum schedules appended to this regulation.

The academic year is divided into three semesters:

- The first semester: Autumn semester (main semester): It starts at the beginning of the university academic year for a period of 14 teaching weeks.
- The second semester: Spring semester (main semester): It starts after the mid-year vacation of the university for a period of 14 teaching weeks.
- Summer semester: It starts in July for a period of 7 teaching weeks doubling the course contact hours.
- Enrolment and Registration take place before the start of each semester.

Article [12]: Study Regulations

All students enrolled in the program must adhere to the following university rules:

A. Tuition Fees

Registration fees and educational services are paid at the start of registration, and the faculty council determines the fees required for registration and educational services after they have been approved by the university council.

B. Payment Rules

The student is not allowed to register at the next level or know his result unless all tuition fees are paid to the lower level. Upon graduation, the student does not receive his papers and certificates indicating that the degree was awarded unless all the late tuition fees have been paid in full.

C. Attendance

The course professor (Fingerprint Device) records the attendance of students at the start of each theoretical lecture, or an exercise / practical workshop in a record prepared for that by the Student Affairs of the program, taking into account the following:

- The absence limit allowed for the students without an acceptable excuse is 25% of the total hours of the course, and the course professor shall notify the Student Affairs Department to warn the student twice, the first warning is after the student exceeds the absence rate of 10% of the course hours, and the second warning is after exceeding the absence rate of 20%. Then, the student's case is presented to the

academic council to take measures needed to prevent him from entering the course exam.

- If the student's absence rate exceeds 25% and the student's absence without an approved excuse is accredited from the academic council of the program, the student will score a deprived grade in the course and the result of a "deprived" grade will be included in the calculation of the student's semester grade and the overall GPA.

D. Partial Discontinuation Condition

Students must notify the academic advisor assigned to them by the academic council when they have stopped their studies for more than a week, and if the discontinuation is a result of illness, a "being sick declaration" must be submitted from an accredited governmental hospital or medical center that is approved by the university's medical administration within the specified times. If the student does not take the exam as a result of the illness, a "being sick declaration" must be introduced within the stipulated timings. In addition, a "being sick declaration" approved by the medical administration of the university must be introduced by whom the student's affairs will be notified of the expected absence period for the student.

E. Enrollment Stoppage

In case that the student stops his enrollment in one of the new programs, the student shall pay the related administrative fees.

F. Address Change

The student must notify the faculty administration of any change in his postal address.

G. Demurrage

If the student is late in paying the fees until the end of the seventh week, a delay fine of (1000) pounds will be imposed, and if he fails to pay until the end of the twelfth week, the fine will be doubled at a minimum, determined by the University Council.

Article [13]: Academic Registration and Academic Load

First: Registration

The academic council of the program announces the dates of registration in the academic curricula through the approved academic agenda. Students should review their choices with the academic advisors assigned to them according to the

instructions written in the program's guide announced on the program's website on the official university website. Registration will not be allowed after the specified date, and if the defaulters are allowed to register, this will be accompanied by a delay fine after being submitted to the academic council.

Second: Advertising

Information on registration steps is announced in advance of each semester (Academic Agenda).

Third: Academic Load Per Semester

The minimum and maximum number of credit hours a student is allowed to register in one semester is determined as follows:

Table (3): The Maximum Registration

No	Student's GPA	Maximum Registration
1	**GPA<2**	14 Credit hours
2	**2≤GPA<3**	17 Credit hours
3	**3≤GPA**	20 Credit hours

- The minimum number of hours a student is allowed to register in **Fall** and **Spring** semesters is 12 credit hours, except for graduation or stumbling cases (under academic observation) based on the approval of the Academic Council.
- Students may register some courses in the summer semester with a maximum of two courses and up to 3 courses in case of graduating in the summer semester. In all cases, graduation projects may not be registered during the summer semester.

Article [14]: The Academic Adviser

The academic council of the program appoints an academic advisor from the teaching staff, at the rate of an academic advisor per 25 students, to guide students in their study trajectory and help them choose the academic courses. Further, he or she determines the number of credit hours they can register according to their circumstances, abilities and academic readiness, and help them solve encountered problems during the study. Besides, he or she supervises the students' study programs, monitoring their progress and monitoring their performance as part of the educational process.

- The academic advisor meets with his/her students periodically to avoid students being exposed to academic warning.
- No administrative procedures are taken for any student except through the academic advisor and with his written approval.

- Each academic advisor determines a time period in his study schedule every week, and a report of this meeting is prepared and submitted to the program management.
- Students must obtain the approval of the academic advisor assigned to them in choosing a study trajectory before registering for courses in each semester and in the summer semester.

Article [15]: Addition, Deletion and Retraction

- After registration, the student may add or delete one of the courses in ways and steps that are approved by the academic council of the program.
- The student may, after the approval of the academic advisor, unregister one or more courses until the end of the fourth week of study only, without violating the academic load stipulated in Article [13].

After the approval of the academic advisor, the student may withdraw from studying any course until the end of the tenth week of the start of registration for the autumn or spring semester (third week of the summer semester). This course is recorded in the student's academic record with a grade of W "withdrawn", provided that the student has not exceeded the percentage of absence prescribed before withdrawal, provided that the withdrawal does not violate the academic load stipulated in Article [13].

Re-registration

The student is allowed to re-register in the study course in which he previously obtained an estimate of **F**, and he is allowed to attend the course and repeat the exam in accordance with the financial regulations that specify that, where the maximum allowed estimate is **B +**.

Elective Courses

In case that the student registers an elective course and fails and registers the same course again, the student gets the maximum grade of B +, while in the case of changing the elective course, the student gets the newly obtained degree.

Article [16]: Projects

- Students prepare 2-3 projects in specific topics related to local industries and service to the surrounding community, to be determined by the Academic Council and during the last two academic years according to what is found in

the special tables of the program curricula, and under the supervision of faculty members who to prepare, supervise and discuss projects.

- The last project, called the Graduation Project, is prepared in the last semester, culminating in what the student has studied during the university years.
- It is permissible that the Academic Council decide to allocate an additional period for the graduation project that begins after the completion of the last semester exam for a period of one month, and at the end of the period allocated to any of the projects the student submits a scientific report on the subject of the project and discusses it.
- The student cannot obtain a bachelor's degree unless he successfully performs all the prescribed projects.

Article [17]: Practical and Field Training

The program includes a training system during the summer vacation for students transferred to levels 200, 300 and 400 and under the supervision of faculty members, as follows:

- **Practical Training**: students transferred to level 200 will perform a practical training within the faculty or in specialized training centers and units within the faculty for a period of two weeks with a total number of hours of not less than 60 hours. The student should get a practical training completion certificate.
- **Field Training**: students transferred to level 300 and those to level 400 perform field training within specialized sectors outside the faculty for a period of four weeks with a total number of hours of at least 120 hours. The student must obtain a certificate from the training authority stating his attendance and obtained the required experience.
  - The faculty is responsible for obtaining training opportunities for students, and students may get training opportunities for themselves, but after faculty council approval is obtained.
  - It is permissible to train students abroad based upon the program academic council approval. The student does not obtain a bachelor's degree unless he has successfully completed both practical and field training.
  - In all training cases, the student is given a Pass/Fail estimate only and his grade is not added to the total grade, but a Pass grade is required to obtain

the course degree. The student who reaches level 400 without successfully completing his training can repeat the training any number of times until he passes the training.

Article [18]: Optional Courses

The student is not allowed to register at any of the elective courses unless he is at the planned level and to achieve all the requirements of the pre-requisites, and in all cases the academic advisor must review the registration of the students and remove any wrong registration.

Article [19]: Courses Registration Synchronization

Fourth level students and students subject to dismissal can register a course in conjunction with the previous prerequisite for the course after obtaining the approval of the program academic council if the following conditions are met:

- The student has previously studied this prerequisite and received an **F** grade.
- This registration does not violate the registration rules according to the GPA.

Article [20]: The Evaluation System

First: Each course is evaluated from (100) one hundred marks.

Second: The student is evaluated in theoretical and practical courses based upon the following elements:

A. In the case of decisions that include only a theoretical study, the evaluation is as follows:

Table (4)

Evaluation		Degree
Semester works	Mid-term exam	20%
	Short exams	30%
	Assignments (report)	
	Presentation and discussions	
Semester Exam (Written)		50%

B. In the case of study courses that include a theoretical and practical study, the evaluation is as follows:

Table (5)

Evaluation		Degree
Semester works	Mid-term exam	20%
	Short exams	20%
	Assignments (report)	
	Presentation and discussions	
Practical Exam		10%
Semester Exam (Written)		50%

C. In the case of the Project Course, 50% of the degree is allocated to periodic follow-up, 50% for oral discussion.

D. For a student to succeed in any course, he or she must obtain at least 60% of the total score and must have obtained at least 40% of the final written examination score.

Article [21]: Degrees and Grades Digital and Symbolic Significance

A. The degrees obtained by the student in each course are estimated as shown in the following table:

Table (6)

The Student's Obtained Percentage	Equivalent Degrees Range					Points No	Grade
From 97% or more	97	98	99	100	--	4,00	A+
93% to less than 97%	**93**	**94**	**95**	**96**	—	**4.00**	**A**
89% to less than 93%	**89**	**90**	**91**	**92**	—	**3.70**	**A-**
84% to less than 89%	**84**	**85**	**86**	**87**	**88**	**3.30**	**B+**
80% to less than 84%	**80**	**81**	**82**	**83**	—	**3.00**	**B**
76% to less than 80%	**76**	**77**	**78**	**79**	—	**2.70**	**B-**
73% to less than 76%	**73**	**74**	**75**	—	—	**2.30**	**C+**
70% to less than 73%	**70**	**71**	**72**	—	—	**2.0**	**C**
67% to less than 70%	**67**	**68**	**69**	—	—	**1.7**	**C-**
64% to less than 67%	**64**	**65**	**66**	—	—	**1.3**	**D+**
60% to less than 64%	**60**	**61**	**62**	**63**	—	**1.0**	**D**
Less than 60%						**0.0**	**F**

B. The course grade is calculated by multiplying the number of credit hours for the course by the number of assessment points (according to Table 6) that the student obtained in this course.

C. The following grades do not fall within the calculation of the average estimate, Table No. (7).

Table (7): Grades Completion

W	Formal Drop out
AU	listener
I	Incomplete
F	Unsuccessful
P	successful

D. Semester GPA:

For each course, the total score of the course is equal to the multiplication of both the number of credit hours of the course and the number of course points.

- The semester average = the total points for the courses in which the student scored in the semester divided by the number of credit hours for these courses.

$$Semester\ GPA = \frac{Numberof Points}{Numberof Graded\ Hours} = \frac{\sum_{i=1}^{N} Grade_i \times Hours_i}{\sum_{i=1}^{N} Hours_i}$$

E. Cumulative GPA

The GPA is calculated as follows:

GPA = the sum of the points for the courses divided by the total number of hours for the courses

$$Comulative\ GPA = \frac{Number\ of\ Points}{Number\ of\ Graded\ Hours} = \frac{\sum_{i=1}^{N} Grade_i \times Hours_i}{\sum_{i=1}^{N} Hours_i}$$

F. Total Cumulative Calculation

The total cumulative is calculated as follows for the number of N courses:

For each course the total equivalent of the course scores is calculated equal to the number of credit hours for the course multiplied by the course score.

Cumulative total percentage is equal to the equivalent of the course grades divided by the total number of hours for the courses:

$$Cumulated\ Marks\ \% = \frac{Equivelent\ Accumulated\ Marks}{Number\ of\ Graded\ Hours}$$

$$= \frac{\sum_{i=1}^{N} Mark_i \times Hours_i}{\sum_{i=1}^{N} Hours_i} \times 100$$

G. Requirements Condition are met

For enrollment in courses requiring other courses as pre-requisites, the student's grade in the pre-requisites should not be less than D.

Article [22]: Graduation Students Grades

The grades obtained by the student upon graduation are granted according to the following schedule:

Table (8)

Estimates Granted upon Graduation from the Program with Credit Hours System

The student's obtained percentage	Equivalent Degrees Range	Estimate	Equivalent grade
97% or more	**4.00**	**A+**	Excellent
93% to less than 97%	**4.00**	**A**	
89% to less than 93%	**3.70**	**A^{-}**	
84% to less than 89%	**3.30**	**B^{+}**	Very good
80% to less than 84%	**3.00**	**B**	
76% to less than 80%	**2.70**	**B^{-}**	
73% to less than 76%	**2.30**	**C^{+}**	Good
70% to less than 73%	**2.0**	**C**	

Article [23]: Honors Grade

Mansoura University grants a certificate of excellence to students who have obtained an average rating of 3.6 or more in previous semesters, provided that they have not failed any course during the study, and this distinction is recorded in the student's academic record.

- Upon graduation, the student is awarded the honor degree if he obtains an average grade of 3.3 or more in all major semesters without failing any course.

Article [24]: Grades Statement

Students who obtain a degree or who drop out from the program have the right to obtain a statement of grades for their academic record, and this statement cannot be obtained during the period of exams, registration, or the date of graduation, and grades data are not given when tuition fees are not paid.

Article [25]: Academic Warning, Transferring and Dismissals

- The student is warned academically if he obtains a GPA of less than 2 at the end of the second semester of his enrollment in the study or any other semester after that.
- The student who is academically warned is placed under academic supervision and is not allowed to register more than 12 credit hours, and the monitoring is stopped if the GPA improves and exceeds the GPA 2.
- A student who is academically dismissed shall be dismissed from credit hour programs if his cumulative GPA falls below 2.00 for six consecutive main semesters.
- If the student does not meet the requirements for graduation during the maximum period of study, which is ten years, he will be dismissed.
- The Faculty Council may consider the possibility of granting a student, subject to dismissal due to his inability to raise his cumulative GPA to at least 2.00 at least, one and last chance of two main semesters to raise his cumulative GPA to 2.00 and fulfil graduation requirements, if he has at least successfully completed 80% of the credit hours required for graduation.
- A student who registers for 17 or more credit hours is considered a regular student, and the student's position in the study is defined according to Table No. (9).

Table (9): The Student's Position Based upon the Number of Credit Hours Passed

Academic level	Defining the student's Place in the study system	The number of credit hours the student has successfully passed	
		<	>=
1	**Freshman**	**32**	**0**
2	**Sophomore**	**64**	**32**
3	**Junior**	**112**	**64**
4	**Senior**	**160**	**112**

Article [26]: Graduation and Obtaining the Degree

For the student to obtain a bachelor's degree:

- The student must have completed (at least) 160 credit hours in studying the courses with a grade of no less than **D**.

- His average grade should not be less than C or more in the cumulative average, and this means that he will obtain at least a cumulative average of 2.00 / 4.00.
- The student fulfills all program requirements.
- Immediately after these conditions are fulfilled, the student's condition will be transferred to a graduate and he may not register any other courses under any of the above items.

Article [27]: Transferring Students -to and from- the Program System

- After approval of the academic council for the program and the Mansoura University Council, it is permissible to transfer students to and from the program with the accredited engineering faculties provided that a clearing is made between the courses studied by the student and the courses that he must study and succeed in, and to complete the clearing process the degrees equivalent to the grades specified in the credit hour system are used as shown in Table (1). Table (10) is used to calculate grades when converting from the credit hour system to faculties that do not use the credit hour system.

Table (10): Equivalence of Estimates when Converting from the Credit Hour System to the Two-Semester System

Credit Hour System		The Semester System	
Number of points	Estimate	Equivalent Estimate	Equivalent Percentage
4.00	**A +**	**Excellent**	**99%**
4.00	**A**		**95%**
3.70	**A-**		**91%**
3.30	**B+**	**Very Good**	**86%**
3.00	**B**		**82%**
2.70	**B-**	**Good**	**78%**
2.30	**C+**		**75%**
2.0	**C**		**72%**
1.7	**C-**	**Passed**	**69%**
1.3	**D+**		**66%**
1.0	**D**		**62%**
0.0	**F**	**Failed**	**Less than 60%**

Article [28]: Appointing Graduates of the Program as a Demonstrators (Teaching Assistants)

- Teaching assistants from the graduates of the program are appointed via a decision from the University President upon the request of the Faculty Council in accordance with Article (**133**) of Law No. **49** of **1972** regarding the organization of universities and without violating the application of Articles **135** and **136** of the same law.
- The Faculty Council distributes teaching assistants newly graduated from the programs to the faculty scientific departments corresponding to their majors and based upon the previously presented annual plan of scientific departments

Article [29]: The Listening System

- It is permissible to accept listening students in any of the courses if there are vacant places provided that the listening student cannot perform the exam, or obtain credit hours for joining this course, or can he obtain an attendance statement for the course from the faculty. They may register late after completing the registration for regular students.

Article [30]: The Improvement System

- The student is allowed to improve in (5) subjects to raise the GPA during the study period, provided that the student gets the last grade, and it is not permissible to drop out from the course after the end of the official period in which withdrawal is permitted without an academic impact (the fourth week of the main semesters). As the expiration of this period entails the removal of the first estimate.
- If the student has completed his studies in the program and his GPA is less than 2, he may improve any of the previously studied subjects until he reaches the required minimum of the GPA.
- The student may not improve a failed course.

Article [31]: Disciplinary Rules

Students who are enrolled in the program are subject to the disciplinary system outlined in the University Regulatory Law and its executive regulations.

Article [32]: Electronic Administration

The university designs or contracts with an information administration system for the program to automate the work of the program with a credit hour system. The following conditions are required in this program:

(A) Course registration.
(B) Adding and removing courses.
(C) Academic Advising.
(D) Program administration work in achieving the rules governing the program.
(E) Grades control work.
(F) Study work and exams.
(G) Financial benefits.
(H) Student affairs work.
(I) Statement of the situation.
(J) Student performance reports.
(K) Record the absence of students.
(L) E-exams.
(M) Communication with students

Taking into account the preservation of confidentiality of data and its recall, ease of use for the student, faculty member and administrative team, and the availability of technical support.

Article [33]: Incomplete Courses

- If a student request not to attend the final exam where he shows compulsive reasons why not to attend, is accepted by the academic council of the program and the faculty council, within two days at most from the final examination date, the course is considered incomplete with an estimate (I) in this course provided that he has obtained at least 60% of the coursework degree or he has been deprived of entering the final exam, in which case he will have the opportunity to take the final exam in the next semester and at the date determined by the faculty council, which is usually in the first week of the next academic semester directly. The degree of the semester work obtained by the student during the semester is added to the final theoretical exam degree, which is conducted by the student.

Article [34]: Appeals for the Results of the Courses

- The student can appeal to review the grades of the course within a week of announcing the result, after paying the fees determined in accordance with the overall regulations associated with this matter.

Article [35]: Implementing the Provisions of the Law Regulating Universities

- The provisions of these regulations apply from the academic year following the date of their issuance to new students admitted to the faculty at the level (000) of those programs, and these regulations do not apply retroactively to any student in the faculty.

Article [36]: General Rules

- The rules of the Universities Regulatory Law, its executive regulations, the internal regulations of the college, and other university regulations are applied in the absence of a text in these regulations.
- The faculty is permitted to add to the list of elective courses with the approval of the Faculty Board and without the need to return to the Engineering Sector Committee.
- The Faculty Council agrees to change the scientific content of the course in a manner that does not conflict with the course name and objectives.

Chapter Two

A B. Sc. Program in Biomedical Engineering with Credit Hours System

1) Introducing the Program

There are many medical and biological applications in general for the various engineering disciplines. This includes in the medical field diagnostic devices (radiology and molecular biology laboratories ...) and treatment (radiology, prosthetic devices and tools ...), as it extends to vital activities and applications in general such as industries pharmacokinetics, sterile rooms, blood laboratories, serums and vaccines.

It is clear that these fields are applications to the study in a number of engineering departments such as electronics, systems, energy, design and control departments. Often, we need complex systems in which a number of the engineering disciplines mentioned above overlap, in order to achieve a specific medical or biological goal. The engineer, who deals with these systems, must have a variety of basic engineering experiences covering the aforementioned engineering disciplines, in addition to basic biological information, in order to be able to study the medical and biological applications of engineering.

The program aims to give the student appropriate background information in the various engineering disciplines mentioned in addition to basic medical information. The program also gives the student the ability to self-learn, to complete the information he may need in any discipline, in order to deal with a specific application problem or to follow the development in it. The combination of the program's coverage of the fundamentals of multiple disciplines and enabling the student to self-learn represents one of the elements of excellence in this program. The most important element of the distinction lies in giving the student the ability to deal with complex systems based on multiple engineering disciplines at the same time and visualize the appropriate system that combines the elements of this complex system. This cannot be achieved within the framework of a biased program for medical and biological applications for only one of the engineering departments.

Last but not least, the program focuses on learning through case studies and multiple projects aimed at solving specific problems in life, not satisfied with one graduation project as is the case in a number of other engineering disciplines, which represents another component of excellence.

- **Program Objectives:**

1. Achieving complementarity between medical and engineering education in the research and applied fields.
2. Providing community service represented in the maintenance of medical devices in all hospitals by graduates of the department.
3. Creating a generation of engineers with a good medical background to work in the field of maintenance and marketing of medical devices from all countries and models.
4. Preparing engineering cadres with a high degree of scientific and administrative ability to lead the team of maintenance of medical devices in specialized companies or agents of manufacturers of medical devices in Egypt.
5. Bridging the gaps that currently exist in the labor market as a result of having engineers who graduate from other engineering departments take over the maintenance of complex medical devices and are not sufficiently familiar with the medical foundations upon which these devices work.
6. Creating a link between the medical team used for each medical device and the technicians who are entrusted with its maintenance in many simple cases, due to the technician's lack of the language that enables them to address the doctors.
7. Working on developing engineering research for amending and improving the technological foundations upon which medical devices work and intensifying the use of computers in all medical fields to support the physician in performing his personal and therapeutic task.

- **Graduate Attributes:**

A graduate of the Biomedical Engineering Program must be able to:

1. Apply general and specialized knowledge and theories in the field of biomedical engineering.
2. Use critical thinking to solve problems that can or cannot be predicted in the context of biomedical engineering specialization taking into account all variables.

3. Master an expanded set of specialized skills in the field of Biomedical Engineering.
4. Carry out critical evaluation of the results of completed tasks and building technical expertise.
5. Identify occupational risks and ways to reduce them.
6. Apply cost-effectiveness measures.
7. Manage the usual and unusual contexts in the field of medical engineering.
8. Use digital and media tools to tackle professional and academic challenges in an innovative way.
9. Study and work independently under the general rules and regulations.
10. Make correct decisions in the context of medical engineering.
11. Take responsibility for himself and the team.
12. Carry out optimal exploitation and development of workplace resources.
13. Apply work ethics.
14. Apply quality assurance standards in all procedures related to medical engineering.
15. The ability to use and calibrate medical devices to check the results required for the diagnosis.
16. Using digital technology and computer diagnostics to assist the doctor in early diagnosis of diseases.

3.1 BME Program Plan Requirements

To prepare the student for the previously-targeted educational objectives, a set of program outcomes, that describes what students are expected to know and is able to do by the time of graduation, have been adopted. The student must successfully pass a number of courses totaling 160 credit hours in order to obtain a bachelor's degree in biomedical engineering from the Faculty of Engineering, Mansoura University.

Level 000

First Semester

Course Code	Course Title	Hours/Week						Marks Distribution					Pre-requisites
		Credit	Lecture	Tutorial	Lab.	Free Work	SWL	Mid-term	Semester Work	Lab.	Final	Total	
BAS011	Mathematics (1)	3	2	2	--	4	8	20	30	--	50	100	----
BAS021	Mechanics (1)	3	2	2	--	4	8	20	30	--	50	100	----
BAS031	Physics (1)	3	2	1	1.5	4.5	9	20	20	10	50	100	----
BAS041	Fundamentals of Engineering Chemistry	3	2	1	1.5	4.5	9	20	20	10	50	100	----
PDE052	Engineering Drawing	3	2	2	--	6	10	20	30	--	50	100	----
UNR061	English (1)	2	1	2	--	2	5	20	30	--	50	100	----
Total		17	11	10	3	25	49					600	
Total Contact hours = 24 hrs/week Total SWL = 49 hrs/week													

Second Semester

Course Code	Course Title	Hours/Week					Marks Distribution						Pre-requisites
		Credit	Lecture	Tutorial	Lab.	Free Work	SWL	Mid-term	Semester Work	Lab.	Final	Total	
BAS012	Mathematics (2)	3	2	2	--	4	8	20	30	--	50	100	BAS011
BAS022	Mechanics (2)	3	2	2	--	4	8	20	30	--	50	100	BAS021
BAS032	Physics (2)	3	2	1	1.5	4.5	9	20	20	10	50	100	----
CSE042	Introduction to Computer Systems	3	2	1	1.5	4.5	9	20	20	10	50	100	----
PDE051	Principals of Manufacturing Engineering	3	2	--	3	3	8	20	20	10	50	100	----
UNR062	English (2)	2	1	2	--	2	5	20	30	--	50	100	UNR061
Total		17	11	8	6	22	47					600	
Total Contact hours = 25 hrs/week Total SWL = 47 hrs/week													

Level 100

Third Semester

Course Code	Course Title	Hours/Week					Marks Distribution						Pre-requisites
		Credit	Lecture	Tutorial	Lab.	Free Work	SWL	Mid-term	Semester Work	Lab.	Final	Total	
BAS113	Mathematics (3)	3	2	2	--	4	8	20	30	--	50	100	BAS012
BAS115	Statistics & Probability Theory	2	1	2	--	3	6	20	30	--	50	100	BAS012
CSE143	Digital Design	3	2	1	1.5	4.5	9	20	20	10	50	100	CSE042
PDE161	Strength of Materials	3	2	2	--	4	8	20	30	--	50	100	BAS021 & BAS031
ELE163	Electrical Circuits	3	2	2	--	4	8	20	30	--	50	100	BAS032
ENG111	Technical Reports Writing	2	1	2	--	3	6	20	30	--	50	100	UNR061
Total		16	10	11	1.5	22.5	45					600	
Total Contact hours = 22.5 hrs/week Total SWL = 45 hrs/week													

Fourth Semester

Course Code	Course Title	Hours/Week					Marks Distribution						Pre-requisites
		Credit	Lecture	Tutorial	Lab.	Free Work	SWL	Mid-term	Semester Work	Lab.	Final	Total	
BAS114	Mathematics (4)	3	2	2	---	4	8	20	30	--	50	100	BAS113
ECE173	Electronics (1)	3	2	2	---	4	8	20	30	--	50	100	ELE163
BME128	Organic Chemistry	3	2	1	1.5	4.5	9	20	20	10	50	100	------
CSE144	Algorithms and Data Structures	3	2	1	1.5	4.5	9	20	20	10	50	100	CSE042
ELE151	Power and Electrical Machines	3	2	2	---	4	8	20	30	--	50	100	ELE163
UNR171	History of Engineering and Technology	1	1	-	-	1	2	20	30	--	50	100	------
BME191	Practical Training	0	0	0	0	3	3	0	0	0	0	0	------
Total		16	11	8	3	25	47					600	
Total Contact hours = 22 hrs/week Total SWL = 47 hrs/week													

Level 200

Fifth Semester

Course Code	Course Title	Hours/Week						Marks Distribution					Pre-requisites
		Credit	Lecture	Tutorial	Lab.	Free Work	SWL	Mid-term	Semester Work	Lab.	Final	Total	
BAS215	Mathematics (5)	3	2	2	--	4	8	20	30	--	50	100	BAS012
ECE284	Electromagnetic Fields	3	2	2	--	4	8	20	30	--	50	100	BAS012
UNR241	Presentation and Communications Skills	2	1	2	--	2	5	20	30	--	50	100	CSE042
BME228	Biochemistry	3	2	1	1.5	4.5	9	20	20	10	50	100	BAS021 & BAS031
BME238	Introduction to Anatomy	3	2	1	1.5	4.5	9	20	20	10	50	100	BAS032
CSE221	Automatic Control	3	2	2	--	4	8	20	30	--	50	100	UNR061
Total		17	11	10	3	23	47					600	
Total Contact hours = 24 hrs/week Total SWL = 47 hrs/week													

Sixth Semester

Course Code	Course Title	Hours/Week						Marks Distribution					Pre-requisites
		Credit	Lecture	Tutorial	Lab.	Free Work	SWL	Mid-term	Semester Work	Lab.	Final	Total	
BME239	Introduction to Physiology	3	2	1	1.5	4.5	9	20	20	10	50	100	BME238
ECE262	Measurements and Instrumentations	3	2	1	1.5	4.5	9	20	20	10	50	100	ELE163
CSE222	Sensors and Actuators	2	1	--	3	2	6	20	20	10	50	100	CSE221
UNR281	Law and Human Rights	2	2	0	0	2	4	20	30	–	50	100	----------
ECE273	Electronics (2)	3	2	1	1.5	4.5	9	20	20	10	50	100	ECE173
ECE295	Signal Analysis	3	2	2	--	4	8	20	30	--	50	100	BAS113
BME291	Field Training (1)	0	0	0	0	3	3	0	0	0	0	0	----------
Total		16	11	5	7.5	24.5	47					600	
Total Contact hours = 23.5 hrs/week Total SWL = 48 hrs/week													

Level 300

Seventh Semester

Course Code	Course Title	Hours/Week					Marks Distribution						Pre-requisites
		Credit	Lecture	Tutorial	Lab.	Free Work	SWL	Mid-term	Semester Work	Lab.	Final	Total	
Elective	Elective Course (1)	3	2	2	--	5	9	20	30	-	50	100	According to Course Specs
BME339	Microbiology	3	2	1	1.5	4.5	9	20	20	10	50	100	BME228
BME345	Biomedical Instrumentations	3	2	1	1.5	4.5	9	20	20	10	50	100	BME239 & ECE262
ECE395	Digital Signal Processing	3	2	2	--	4	8	20	30	-	50	100	ECE295
BME358	Biomaterial Properties	3	2	1	1.5	4.5	9	20	20	10	50	100	PDE161
Total		15	10	7	4.5	22.5	44					500	
Total Contact hours = 21.5 hrs/week Total SWL = 44 hrs/week													

Eighth Semester

Course Code	Course Title	Hours/Week					Marks Distribution						Pre-requisites
		Credit	Lecture	Tutorial	Lab.	Free Work	SWL	Mid-term	Semester Work	Lab.	Final	Total	
BME392	Clinical Engineering	2	1	--	3	2	6	20	20	10	50	100	BME239 & BME345
ECE396	Digital Image Processing	3	2	--	3	4	9	20	20	10	50	100	ECE395
CSE323	Embedded Systems	2	1	1	1.5	2	5.5	20	20	10	50	100	CSE221
Elective	Elective Course (2)	3	2	2	--	5	9	20	30	--	50	100	According to Course Specs
BME346	Bioinformatics	3	2	2	--	4	8	20	30	--	50	100	ECE395
BME393	Project (1) in BME	3	2	1	1.5	4	8.5	--	50	--	50	100	Reaching level 300
BME391	Field Training (2)	0	0	0	0	3	3	0	0	0	0	0	----------
Total		16	10	6	9	24	49					600	
Total Contact hours = 25 hrs/week Total SWL = 49 hrs/week													

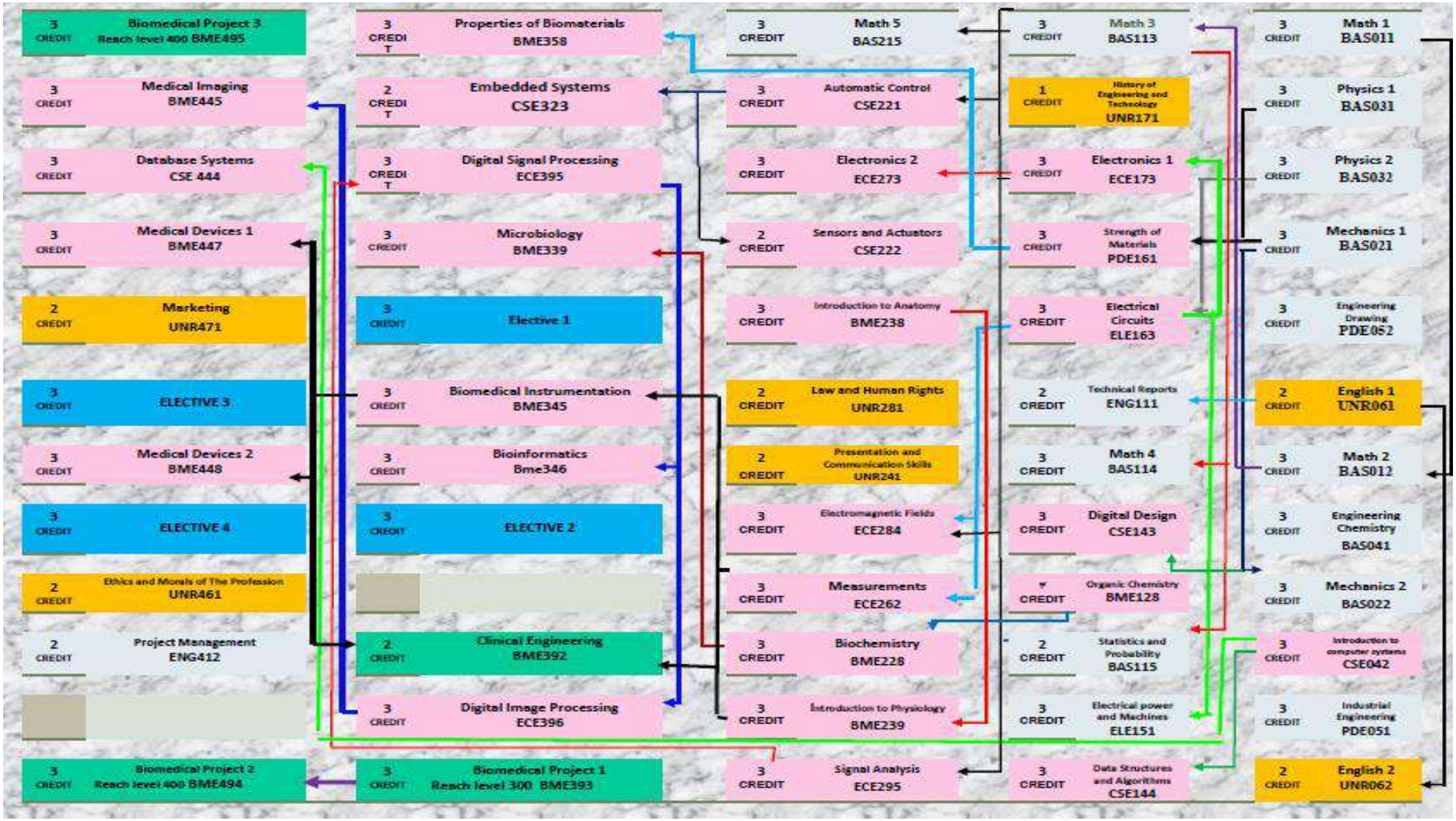
Level 400

Ninth Semester

Course Code	Course Title	Hours/Week					Marks Distribution						Pre-requisites
		Credit	Lecture	Tutorial	Lab.	Free Work	SWL	Mid-term	Semester Work	Lab.	Final	Total	
Elective	Elective Course (3)	3	2	2	--	5	9	20	30	--	50	100	According to Course Specs
BME445	Biomedical Imaging	3	2	1	1.5	4.5	9	20	20	10	50	100	ECE396
BME447	Medical Equipment (1)	3	2	--	3	3	8	20	20	10	50	100	BME345
ENG412	Project Management	2	1	2	--	3	6	20	30	--	50	100	--------
UNR471	Marketing	2	2	--	--	2	4	20	30	--	50	100	--------
BME494	Project (2) in BME	3	1	2	3	8	14	--	50	--	50	100	Reaching Level 400
Total		16	10	7	7.5	25.5	50					600	
Total Contact hours = 24.5 hrs/week Total SWL = 50 hrs/week													

Tenth Semester

Course Code	Course Title	Hours/Week					Marks Distribution						Pre-requisites
		Credit	Lecture	Tutorial	Lab.	Free Work	SWL	Mid-term	Semester Work	Lab.	Final	Total	
BME448	Medical Equipment (2)	3	2	--	3	3	8	20	20	10	50	100	BME345
UNR461	Ethics and Morals of the Profession	2	2	--	--	2	4	20	30	--	50	100	----------
CSE444	Database Systems	3	2	1	1.5	4.5	9	20	20	10	50	100	CSE042
Elective	Elective Course (4)	3	2	2	--	5	9	20	30	--	50	100	According to Course Specs
BME495	Project (3) in BME	3	1	2	3	8	14	--	50	--	50	100	Reaching Level 400
Total		14	9	5	7.5	22.5	44					500	
Total Contact hours = 21.5 hrs/week Total SWL = 44 hrs/week													



متطلبات جامعة	متطلبات كلية	تخصص عام ودقيق	تدريب عملى ومشاريع	مقررات اختيارية

4. BME Program Courses Syllabi

4.1. University Requirements

UNR061	English (1)								Prerequisites
2 Cr	Lecture	1	Tutorial	2	Lab.	--	Semester	1st	---
Main skills of the English language - listening to short and long conversations - reading scientific passages - writing reports, summaries, and scientific articles - speaking and presenting new ideas									
References: ▪ *Mark Ibbotson, Cambridge English for Engineering Student's book free, Cambridge press 2011*									

UNR062	English (2)								Prerequisites
2 Cr	Lecture	1	Tutorial	2	Lab.	--	Semester	1st	UNR061
Analysis and interpretation of engineering issues - summarizing engineering issues - preparation for language tests.									
References: ▪ *Mark Ibbotson, Cambridge English for Engineering Student's book free, Cambridge press 2011*									

UNR171	History of Engineering and Technology								Prerequisites
1 Cr	Lecture	1	Tutorial	--	Lab.	--	Semester	2nd	---
Engineering history: Art, Science, Engineering and technology - Role of engineering and technology in development and establishment of civilizations -Technology and environment - Examples on development of engineering activity.									
References: ▪ *Roger S. Kirby, Engineering in History, Dover Publications Inc. New York, United States, 1990, ISBN10 0486264122*									

UNR281	Law and Human Rights								Prerequisites
2 Cr	Lecture	2	Tutorial	--	Lab.	--	Semester	2ed	---
Systems and laws of institutions - Introduction to Accounting - Labor legislation and laws governing engineering professions - Industrial security legislation and environment - Historical philosophical origins of human rights - international sources of human rights - national sources of human rights - global bodies based on the protection of human rights.									

UNR241	Communication and Presentation Skills								Prerequisites
2 Cr	Lecture	1	Tutorial	2	Lab.	--	Semester	1st	---
Communication skills - Presentation planning and preparation - Delivery skills such as eye contact, voice control, gestures, body language and appearance - Presenter's characteristics - Using visuals - Presentation structure - Elevator Pitch									

References:

- *Joan van Emden, Lucinda Becker, Presentation Skills for Students, 3rd Edition, Red Globe Press, 2016*
- *M. Wa Mutua, S. Mwaniki, P. Kyalo, B. Sugut, Communication Skills: A University Book, Succex Publishers, 2016*
- *Ian Tuhovsky, Wendell Wadsworth, Communication Skills Training, Ian Tuhovsky, 2015*
- *Tabitha Wambui, Alice W. Hibui, Elizaeth Gathuthi, "Communication skills " Vol.1, Students' coursebook, LAP LAMBERT Academic Publishing, 2012*

UNR461	Ethics and Morals of The Profession								Prerequisites
2 Cr	Lecture	2	Tutorial	--	Lab.	--	Semester	1st	---
General principles of professional ethics - Commitments to society - Responsibilities of the engineer - Detection of violations - Behavior - Case studies and general issues.									
References: ▪ *Lizabeth A. Stephan, David R. Bowman, William J. Park, Benjamin L. Sill, Matthew W. Ohland, "Thinking like an engineer", Published by Pearson 2018.* ▪ *Harris, C. E., Jr., Pritchard, M. S., & Rabins, M. J. Engineering Ethics. Second edition. Belmont, CA: Wadsworth, 2000*									

UNR471	Marketing								Prerequisites
2 Cr	Lecture	2	Tutorial	--	Lab.	--	Semester	1st	---
Principles of products marketing - Marketing research - Customers buying behavior - Marketing mix - Plotting marketing strategy - Building marketing plan - Pinpointing the target market - Marketing on the world wide web - Branding strategy - Developing new products - Advertising and promotions - Costing and pricing strategies - Case studies on products marketing									
References: ▪ *Principles of Marketing, University of Minnesota Libraries Publishing, 2015, ISBN 13: 9781946135193*									

4.2. Faculty Requirements

BAS011	Mathematics (1)								Prerequisites
3 Cr	Lecture	2	Tutorial	2	Lab.	--	Semester	1st	---
Calculus: Function (definition - theorems) - Basic functions - limits - Continuity - Derivation - definition - theorems - types - higher orders - Applications on derivatives - partial derivatives - indefinite integral - theories and properties of integration. Algebra: Binomial theorem (with any exponent and applications) - Partial Fractions - Theory of Equations - Matrices - System of linear equations - Gauss elimination method.									
References: ▪ *Akhtar & Ahsan, Textbook of Differential Calculus, second edition, 2009, PHI Learning Private Limited.* ▪ *Alan Jeffrey, Matrix operations for Engineers and Scientists, 2010, Springer Science & Business Media.*									

BAS021	Mechanics (1)								Prerequisites
3 Cr	Lecture	2	Tutorial	2	Lab.	--	Semester	1st	---
Newton's laws - Types of forces، coplanar forces، Rectangular components of vector (1D, 2D, Space), Forces in space - Equilibrium of a particle - Conditions, Free-body diagram - Moment - Couple moment - Resultant of a system of forces and couples as a force and couple system - General procedure for reducing force and couple systems - Equilibrium of a rigid body - Conditions of equilibrium of a rigid-body، free body diagrams – friction									
References: ▪ *R.C. Hibbeler, "Engineering Mechanics: Statics and Dynamics, 14th Edition", Pearson Prentice Hall, New Jersey, 2016.* ▪ *J. L. Meriam, L. G. Kriage, and J. N. Botton, "Engineering Mechanics: Statics, 8th Edition", John Wiley & Sons, New York, 2016.*									

BAS012	Mathematics (2)								Prerequisites
3 Cr	Lecture	2	Tutorial	2	Lab.	--	Semester	2ed	**BAS011**
Integral Calculus: Definite integral - Methods of integration – Applications on definite integral (plane area - volume of revaluation - length of a plane curve - area of surfaces of revolution) - improper integral. Analytic Geometry: Equations of second degree - Equation of pair of straight lines - Translation of axes - Conic sections - parabola - ellipse - hyperbola) Equation of plane - Equation of sphere.									
References: ▪ *Jumarie, G., Fractional Differential Calculus for Non-Differentiable Functions: Mechanics, Geometry, Stochastics, Information Theory. 2013: LAP Lambert Academic Publishing.* ▪ *Hestenes, D. and G. Sobczyk, Clifford algebra to geometric calculus: a unified language for mathematics and physics. Vol. 5. 2012: Springer Science & Business Media.* ▪ *Grossman, S.I., Multivariable calculus, linear algebra, and differential equations. 2014: Academic Press.*									

BAS022	Mechanics (2)								Prerequisites
3 Cr	Lecture	2	Tutorial	2	Lab.	--	Semester	2ed	**BAS021**
Kinematics of a particle: curvilinear motion - Normal and tangential components. - Newton's laws - motion of projectiles - Work and energy of a particle - applications of friction.									
References: ▪ *R.C. Hibbeler, "Engineering Mechanics: Statics, 11th Edition", Pearson Prentice Hall, 2006.* ▪ *F. P. Beer, and E. R. Johston, Jr., D. F. Mazurek, P. J. Cornwell, E. R. Eisenberg, "Vector Mechanics for Engineering, Statics and Dynamics, 9th Edition", McGraw-Hill, New York, 2010.*									

BAS031	Physics (1)								Prerequisites
3 Cr	Lecture	2	Tutorial	1	Lab.	1.5	Semester	1st	---
Material properties: Physical quantities - Standard units and dimensions - Mechanical properties for materials - Fluid properties - Periodic motion - Mechanical waves - Sound									

waves - Waves in elastic media.

Heat and thermodynamics: Temperature measurements and thermometers - Thermal expansion - Specific and latent heat - Heat transfer - Gas motion theory - First law of thermodynamics - Entropy and second law of thermodynamics.

References:

- *Physics for Scientists and Engineers, R.A. Serway and J.W. Jewett, 6th Edition, Thomson Brooks/Cole 2014.*
- *Paul A. Tipler, " Physics for scientists and engineers" sixth edition, 2008.*

BAS032	Physics (2)								Prerequisites
3 Cr	Lecture	2	Tutorial	1	Lab.	1.5	Semester	2nd	---

Electricity and Magnetism: Electric charge - Electric force - Electric field- Column's law- Electric flux- Gauss law- Electric potential- Electric capacitance and Dielectrics - Ohm's law and simple circuits- Magnetic field - Baiot and Savart laws.

Optics and Modern physics: Nature of light and laws of geometric optics - Interference - Diffraction - polarization - optical fiber - laser - photoelectric effects - principle of quantum theory - special theory of relativity.

References:

- *Physics for Scientists and Engineers, R.A. Serway and J.W. Jewett, 9th Edition, Thomson Brooks/Cole 2014.,*
- *Paul A. Tipler, " Physics for scientists and engineers" sixth edition, 2008.*

BAS041	Principals of Engineering Chemistry								Prerequisites
3 Cr	Lecture	2	Tutorial	1	Lab.	1.5	Semester	1st	---

Equations of state-chemical thermodynamics - Material and energy balance in chemical processes- properties of solutions - Basic principles in electrochemistry and it's applications- selected topics in chemical industry.

References:

- *Brown, L. T, LeMay H. E. Jr; Bursten, B. E.; Murphy, C.J., and Woodward, P.; " Chemistry The Central Science", Pearson International Edition (11th edn), Pearson Printice Hall, (2009).*

PDE051	Principles of Manufacturing Engineering								Prerequisites
3 Cr	Lecture	2	Tutorial	--	Lab.	3	Semester	2ed	---

Introduction to the following processes (Casting- Forging- Metal filing - Machining- Forming- Woodworking)

References:

- *Hitomi, Katsundo. Manufacturing Systems Engineering: A Unified Approach to Manufacturing Technology, Production Management and Industrial Economics. Routledge, 2017.*

PDE052	Engineering Drawing								Prerequisites
3 Cr	Lecture	2	Tutorial	2	Lab.	--	Semester	1st	---

Two-dimensional drawings - Free-hand sketching - Sectional views - Auxiliary views and conventions - Computer-aided drawing (CAD) of 2D and 3D figures.
References: ▪ *Mcgraw-hill Mint, "Mechanical Drawing Board & CAD Techniques", Student Edition,2011*

ENG111	Technical Reports Writing								Prerequisites
2 Cr	Lecture	1	Tutorial	2	Lab.	--	Semester	2nd	UNR062
Technical writing definition - audience analysis - technical writing styles - technical document characteristics - automated document organization - official and unofficial document types - structure of different types of technical documents.									
References: ▪ *G. J. Alred, W. E. Oliu, The Handbook of Technical Writing, 12th Edition, Bedford/St. Martin's; 2018* ▪ *K. Hyland, Teaching and researching writing. 3rd edition Routledge academic publisher, 2016* ▪ *M. Markel, Technical Communication, 11th edition, MacMillan, 2015.*									

BAS113	Mathematics (3)								Prerequisites
3 Cr	Lecture	2	Tutorial	2	Lab.	--	Semester	1st	**BAS012**
Applications of partial differentiation - Maximum values of functions in more than one variable and applications - First order differential equations - Second order differential equations - Laplace transform and its applications - Analytical geometry in space.									
References: ▪ *D. Backman, "Advanced Calculus Demystified", McGraw-Hill, 2007.* ▪ *S. A. Wirkus, and R. J. Swifi, "A Course of Ordinary Differential Equations", Taylor & Francis Group, LLC, 2015.*									

BAS114	Mathematics (4)								Prerequisites
3 Cr	Lecture	2	Tutorial	2	Lab.	--	Semester	2ed	**BAS113**
Fourier series - Fourier transform - Complex numbers - Functions of a complex variable - Complex integration - Residue theorem - Direction derivatives - Double integrals - Triple integrals - Line integrals - Surface integrals.									
References: ▪ *J. Brown, and R. Churchill, "Complex Variables and Applications", 9th Edition, McGraw-Hill, 2013.* ▪ *D. Backman, "Advanced Calculus Demystified", McGraw-Hill, 2007.*									

BAS115	Statistics and Probability Theory								Prerequisites
2 Cr	Lecture	1	Tutorial	2	Lab.	--	Semester	1st	**BAS012**
Measures of tendency and dispersion - Probability distributions - Sampling theorem - tests of hypothesis - non-parametric tests - regression and correlation - time series.									
References: ▪ *Mary C. Meyer, Probability and Mathematical Statistics: Theory, Applications, and Practice in RSBN-10: 1611975778, SIAM (June 24, 2019)*									

ELE151	Electrical Power and Machines	Prerequisites

3 Cr	Lecture	2	Tutorial	2	Lab.	--	Semester	2ed	---

Power: Electrical power systems - three phase systems - Theory and models of transformers - Transmission line models - Voltage and frequency control - effective and ineffective power - Optimal work of power systems.

Machines: The theory of operation - The construction of the Direct Current motors. The speed، torque، and current characteristics - applications of the DC motors. The theory of operation and construction of stepper motors - Permanent-magnet DC motor and Low-inertia DC Motors. The theory of operation، construction of three phase induction motors.

References:

- *Nilsson, J.W. and S.A. Riedel, Electric circuits. 2015: Pearson Upper Saddle River, NJ.*
- *Slade, P.G., Electrical contacts: principles and applications. 2017: CRC press.*

BAS215	Mathematics (5)								Prerequisites
3 Cr	Lecture	2	Tutorial	2	Lab.	--	Semester	1st	**BAS113**

Numerical solution of linear and non-linear systems of equations - Iterative methods - Curve fitting: Least square of (Straight lines, Polynomials), Linearization of nonlinear relationship. Interpolation and polynomial approximation -finite difference operators - Numerical integration and differentiation.

References:

- *Mazumder, Numerical Methods for Partial Differential Equations, Finite Difference and Finite Volume Methods, science direct ,2016.*
- *Sheldon Rose, A First course in probability, Eighth edition, 2010, Pearson Prentice Hall.*

ENG412	Project Management								Prerequisites
2 Cr	Lecture	1	Tutorial	2	Lab.	--	Semester	1st	---

Fundamentals of biomedical project management - Integration management - Scope management - Time management - Cost management - Quality management - Human resources management - Communication management - Risk management - Procurement management - Biomedical projects case studies

References:

- *Kerzner, H. and H.R. Kerzner, Project management: a systems approach to planning, scheduling, and controlling. John Wiley & Sons, 2017.*
- *Kalpakjian, S., K. Vijai Sekar, and S.R. Schmid, Manufacturing Engineering and technology. Pearson, 2014.*
- *Nigel J. Smith, "Engineering Project Management", 3rd Edition, Wiley-Blackwell, 2008.*

4.3. BME Requirements

3 Cr	Introduction to Computer Systems								CSE042
M	Lectures	2	Tutorial	1	Lab	1.5	Semester	2	

Pre-requisites: UNR032

Introduction to the design and operation of digital computers: types of data and its representation and number systems - the basic components of the computer and the organization of the computer and the ways of transfer of information- programming with Visual Basic - Introduction to information networks

Introduction to Programming: Program Structure and Command Types - Presentation of key commands - simple software development

Training Fundamentals: Dealing with Common Operating Systems (Windows – Linux) - Software Development and Desktop Software

Reference:

- *H. Rogler, " Introduction to Computer Systems", Kendall Hunt Publishing; 3 edition, 2018*

3 Cr	Strength of Materials								PDE161
M	Lectures	2	Tutorial	2	Lab	0	Semester	1	

Pre-requisites: BAS031 &BAS021

Types of loads acting on mechanical components - Force analysis of simple mechanical elements - Axial forces، shear forces، bending and twisting moments - Stress، strain and Hook's law - Design stresses and factor of safety - Stress concentrations - Thermal stresses - Bearing stresses - Direct and torsional shear stresses - Bending stress and eccentric loading - Bending stresses and shear stresses in beams - Stress and strain analysis - Stresses in two dimensions - principal stresses and maximum shear stresses.

Reference:

- *R. K. Bansal, "A Text Book of Strength of Materials", Laxmi Publications, 4th edition , 2010*

3 Cr	Electric Circuits								ELE163
M	Lectures	2	Tutorial	2	Lab	0	Semester	1	

Pre-requisites: BAS032

Elements of electrical circuits - Simple resistive circuits - Analysis of DC circuits - Theories of electrical circuits - First-order circuits –steady AC sinusoidal circuits - Power and power factor - Resonance circuits - Three-phase circuits.

Reference:

- *J. W. Nilsson, "Electric Circuits", Pearson; 11th edition, 2018*

3 Cr	Electronics (1)								ECE173
M	Lectures	2	Tutorial	2	Lab	0	Semester	2	

Pre-requisites: ELE163

Semiconductors – pn junction – biasing of pn junction –types of pn junction diodes – bipolar junction transistors and their properties and applications in DC circuits – Field-effect transistors (JFET& MOSFET)and their properties and applications in DC circuits.

Reference:

- *T. Floyd, "Electronic Devices", 10th edition, Pearson, 2018*

3 Cr	Digital Design								CSE143
M	Lectures	2	Tutorial	1	Lab	1.5	Semester	1	

Pre-requisites: CSE042

Binary algebra and logic gates – Binary function simplification –Analysis and design of synthetic logic circuits – components of programmable logic devices – Introduction to synchronous logic – Analysis of time-controlled serial circuits – Programmable logic arrays – Introduction to logic design laboratory – Design and connection of digital circuits using traditional or high level design programs using VHDL – Basic design using program – Basic design using structural graph editor – Functional simulation – Design verification – Flow design of digital circuits using new computational programs.

Reference:

- *M. Mano, "Digital Design" , Pearson; 6th edition, 2017*

3 Cr	Algorithms and Data Structure								CSE144
M	Lectures	2	Tutorial	1	Lab	1.5	Semester	2	

Pre-requisites: CSE042

Introduction to data structures - Different Data representations- Study the structure، properties، and implementation issues of different data structures (Array – Stack – queue،..) -Data Structure Storing ، ordering and sorting algorithms. - Study Different search algorithms - Evaluation and analysis of studied algorithms using a recent programming language.

Reference:

- *A. Khot, " Learning Functional Data Structures and Algorithms", Packt Publishing, 2017*

3 Cr	Organic Chemistry								BME128
M	Lectures	2	Tutorial	1	Lab	1.5	Semester	2	

Pre-requisites: ---

Functional groups - Aliphatic compounds - Aromatic compounds - Cyclic compounds - Polymers - Biomolecules - Fullerenes and small molecules

Reference:

- *L. Wade, " Organic Chemistry" , Pearson; 9th edition, 2016*

3 Cr	Automatic Control								CSE221
M	Lectures	2	Tutorial	2	Lab	0	Semester	1	

Pre-requisites: BAS113

Fundamentals of control – Mathematical model for linear systems and Laplace transform – Systems representation (Block diagram – Transfer Functions – Signal Flow Graph) – Modeling of electrical and mechanical systems – State variables – System analysis in time and frequency domains – Root Locus – Systems Stability – Introduction to proportional-differential-integral controller – System analysis using suitable software – Static performance – Response analysis – Introduction to control systems – Types of optimal control – Optimal linear follow-up system

– Multi-variable systems

Reference:

- *F. Golnaraghi, " Automatic Control Systems", McGraw-Hill Education; 10th edition, 2017*

2 Cr	Sensors and Actuators								CSE222
M	Lectures	1	Tutorial	0	Lab	3	Semester	2	

Pre-requisites: CSE221

Sensor performance criteria and selection - Thermocouples - Resistive sensors - Inductive sensors - Capacitive sensors - Piezoelectric sensors - Encoders and tachometers - Actuator performance criteria and selection - Fluidic actuators - Solenoids and voice coil motors - Stepper motors - DC motors - Piezoelectric actuators - Shape memory alloy actuators - MEMS sensors and actuators

Reference:

- *C. de Silva," Sensors and Actuators: Engineering System Instrumentation" , CRC Press; 2nd edition, 2015*

3 Cr	Measurements and Instrumentation								ECE262
M	Lectures	2	Tutorial	1	Lab	1.5	Semester	2	

Pre-requisites: ELE163

Statistical analysis of data – DC measurement devices - DC measurement devices – Oscillososcope – DC bridges – AC bridges – Transducers – Digital voltmeters

Reference:

- *A. Morris, "Measurement and Instrumentation Theory and Application", Academic Press; 2nd edition, 2015*

3 Cr	Electronics (2)								ECE273
M	Lectures	2	Tutorial	1	Lab	1.5	Semester	2	

Pre-requisites:ECE173

Small signal analysis of different transistor types – Amplifiers (operational amplifier – power amplifier – feed-back amplifier – differential amplifier) – multi-stage amplifiers – analog and digital integrated circuits – filters – oscillators – signal generators – wave shaping

Reference:

- *T. Floyd, "Electronic Devices", 10th edition, Pearson, 2018*

3 Cr	Electromagnetic Fields								ECE284
M	Lectures	2	Tutorial	2	Lab	0	Semester	2	

Pre-requisites: BAS113 &ELE163

Coordinate systems – charges in space – Coulomb's law – electric field - electric flux –Gauss's law and its applications – electric potential – work and energy – capacitance – conductors and dielectrics – boundary conditions – Poisson and Laplace equations and their applications – magnetic field – magnetic flux – varying magnetic field – Faraday's law – Maxwell equations

Reference:

- *W. Hayt, "Engineering Electromagnetics", 8th edition, McGraw Hill, 2010*

3 Cr	Signal Analysis								ECE295
M	Lectures	2	Tutorial	2	Lab	0	Semester	2	

Pre-requisites: BAS113

Classification signals and systems - linear time-invariant analog systems - linear time-invariant digital systems - Laplace transform and its applications on analog signals - analog system properties - Z-transform and its applications on discrete-time signals - digital system properties - analog Fourier transform and its applications - digital Fourier transform and its applications.

Reference:

- *B. Boashash , "Time-Frequency Signal Analysis and Processing", Academic Press; 2nd edition, 2015*

3 Cr	Biochemistry								BME228
M	Lectures	2	Tutorial	1	Lab	1.5	Semester	1	

Pre-requisites: BME128

Structures، functions and interaction between cell components including proteins، carbohydrates، fats، nucleic acids and other biological cells - nucleic acids - proteins formation

Reference:

- *D. Nelson , "Principles of Biochemistry", W. H. Freeman, 7th edition, 2017*

3 Cr	Introduction to Anatomy								BME238
M	Lectures	2	Tutorial	1	Lab	1.5	Semester	1	

Pre-requisites: ---

Introduction - different organs and parts that form the human body system including gastrointestinal system، respiratory system، cardiovascular system، lymphatic system, genitourinary system and endocrinal system- skeletal parts of the human body and the control of various muscles and joints.

Reference:

- *E. Solomon, "Introduction to Human Anatomy and Physiology", Saunders; 4th edition, 2015*

3 Cr	Introduction to Physiology								BME239
M	Lectures	2	Tutorial	1	Lab	1.5	Semester	2	
Pre-requisites: BME238									
Cell Transport - Excitable Membranes and Synapses - Smooth and Cardiac Muscle - Cardiac Electrophysiology and ECGs - Cardiac Mechanics and Systemic Circulation - Control of the Cardiovascular System - Repiratory Mechanics، Gas Transport، and Control of Breathing - Autonomic Nervous System - Brain and Spinal Cord - Somatic Nerves and Control of Movement - Auditory System - Visual System - Renal System - Endocrine System									
Reference: • *S. Fox ," Human Physiology", McGraw-Hill Education; 15th edition, 2018*									

2 Cr	Embedded Systems								CSE323
M	Lectures	2	Tutorial	1	Lab	1.5	Semester	2	
Pre-requisites: CSE221									
Specifications of microcontrollers - common hardware/ software، peripherals and interfacing - memory، performance analysis and optimization - CAD tools - FPGA design flows - Low-power computing، and circuit architectures - research، design and development، of electronic devices - Applications: medical devices، pacemakers، cochlear implants، insulin pumps									
Reference: J. Valvano, "Introduction to Embedded Systems", Create Space Independent Publishing Platform; 1st edition, 2016									

3 Cr	Digital Signal Processing								ECE395
M	Lectures	2	Tutorial	2	Lab	0	Semester	1	
Pre-requisites: ECE295									
Converting analog signals to digital signals - IIR digital filter design - FIR digital filter design - implementation of digital filters - Wiener filter - adaptive filters - data compression and encryption - applications on biomedical signals.									
Reference: • *Lizhe Tan, "Digital Signal Processing: Fundamentals and Applications", Academic Press; 3rd edition, 2018*									

3 Cr	Digital Image Processing								ECE396
M	Lectures	2	Tutorial	0	Lab	3	Semester	2	
Pre-requisites: ECE395									
Image acquisition and sampling - types of digital images - point processing - image histograms - neighborhood processing - edge sharpening - 2D-Fourier transform - transform processing - image restoration in spatial and frequency domains - image segmentation - edge detection - Hough transform - morphological operations - processing of color images.									
Reference:									

- *Rafael C. Gonzalez, " Digital Image Processing" , Pearson; 4th edition, 2017*

3 Cr	Microbiology								BME339
M	Lectures	2	Tutorial	1	Lab	1.5	Semester	1	
Pre-requisites: BME228									
Prokaryoticand Eukaryotic cells، Nomenclature and structure of microorganisms، Spores، Fungi، Viruses، Bacterial genetics، Growth curve and growth requirements of microorganisms، Types of Microscopes، Medically important microorganisms، Parts of the immune system									
Reference:									
• *G. Tortora, " Microbiology: An Introduction" , Pearson; 13th edition, 2018*									

3 Cr	Biomedical Instrumentation								BME345
M	Lectures	2	Tutorial	1	Lab	1.5	Semester	1	
Pre-requisites: BME239 & ECE262									
Fluorescent microscopy، Florescence process، bioelectronics and biomechanical instruments، Applications of statistics، probabilities، signal analysis، noise suppression، and Fourier techniques in bioinstrumentation, biomedical embedded systems، biomedical mini-project.									
Reference:									
• *A. Webb, "Principles of Biomedical Instrumentation", Cambridge University Press; 1st edition, 2017*									

3 Cr	Biomaterial Properties								BME358
M	Lectures	2	Tutorial	1	Lab	1.5	Semester	1	
Pre-requisites: PDE161									
Physical and chemical surface properties of selected materials، – Surface measuring instruments – Modification of surface properties of materials – Acute and chronic response to implanted biomaterials – Design of biomaterial implants and artificial organs									
Reference:									
• *W. Murphy, "Handbook of Biomaterial Properties", Springer; 2nd edition, 2016*									

3 Cr	Bioinformatics								BME346
M	Lectures	2	Tutorial	2	Lab	0	Semester	2	
Pre-requisites: ECE395									

Review of DNA replication، transcription، and translation، Genome organization - Review of molecular biology methods - DNA and protein databases، data storage، file formats، information retrieval - Database queries، sequence retrieval، Creation of restriction endonuclease maps - Dot plots، Sequence alignment، Local alignment، Global alignment، Multiple alignments - Alignment scores، Statistical significance of database searches - Genetic distances، Distance based phylogenies، Phylogenetic tree construction - Consensus sequences، Finding genes and open reading frames in DNA sequences - Microarrays and the transcriptome - Microarray analysis and applications of microarrays - Introduction to proteomics - Prediction of protein structure and function - Comparative genomics - Future directions of bioinformatics.

Reference:

- *J. Momand, "Concepts in Bioinformatics and Genomics" , Oxford University Press; 1st edition, 2016*

3 Cr	Database Systems								CSE444
M	Lectures	2	Tutorial	1	Lab	1.5	Semester	2	

Pre-requisites: CSE042

Introduction to database Concepts -Data Structure handling and File Systems - Database Management systems operation and Components - Data Modeling ANSI/SPARC – Client Server - Relational Databases (indexing- keys – sorting) - Structured Query Languages (SQL) - Schema Design and normalization - E/R Model and database Programming -Practical implementation using recent DBMS- implementing a database using MYSQL DBMS.

Reference:

- *C. Coronel, "Database Systems: Design, Implementation, & Management", Cengage Learning, 13th edition, 2018*

3 Cr	Medical Imaging								BME445
M	Lectures	2	Tutorial	1	Lab	1.5	Semester	1	

Pre-requisites: ECE396

Medical image modalities (Magnetic resonance imaging، X-ray- Computed tomography- ultrasonic)- different formats of medical images and medical files- image reconstruction- principles of computer- aided medical image analysis- statistical analysis of medical images- medical image processing- medical image understanding (spatial- temporal- spectral)- Medical image modeling- programming techniques for medical image analysis- classical and recent computer aided technologies for medical image analysis (e.g.- deep learning)- relevant mini-project

Reference:

- *A. Maier, "Medical Imaging Systems", Springer Open, 2018*

3 Cr	Medical Equipment (1)								BME447
M	Lectures	2	Tutorial	0	Lab	3	Semester	1	

Pre-requisites: BME345

Electrocardiographs - EEG - EMG - Ventilators - Patient Monitor - Diathermy - Anesthesia - Dialysis - robotic surgeon - dental devices

Reference:

- *E. Tobin, "The Medical Device Engineers Handbook" , Create Space Independent Publishing Platform, 2016*

3 Cr	Medical Equipment (2)								BME448
M	Lectures	2	Tutorial	0	Lab	3	Semester	2	

Pre-requisites: BME345

MRI Equipment - CT Scanner - X-Ray Equipment - PET Equipment - Ultrasound Equipment - Gamma Camera - Medical Endoscopy - Prosthetic Devices

Reference:

- *E. Tobin, "The Medical Device Engineers Handbook" , Create Space Independent Publishing Platform, 2016*

3 Cr	Medical Decision Support Systems (MDSS)								CSE362
E	Lectures	2	Tutorial	2	Lab	0	Semester	--	

Pre-requisites: ----

Introduction to Decision making process - Decision Making under Certainty and Uncertainty - Linear Programming - Graphical LP solution - Simplex method - Representation of clinical knowledge، guidelines and recommendations; Interfaces for decision support; Search and ranking recommendations; - Methods for authoring and validation of clinical guidelines; Evaluation، efficacy and consistency - Precision medicine.

Reference:

- *E. Berner, "Clinical Decision Support Systems: Theory and Practice", Springer; 3rd edition, 2016*

3 Cr	Healthcare Information Systems (HCIS)								CSE363
E	Lectures	2	Tutorial	2	Lab	0	Semester	--	

Pre-requisites: CSE144

Introduction to Healthcare Informatics - Process Fundamentals: Motivation and modeling constructs - Metrics and methods -Process Enabled Information Technology (PEIT)Framework - Electronic Health Records (EHR): Definitions، content، and technology - Electronic Health Records (EHR): Adoption and use issues - Computerized Physician Order Entry (CPOE) - Healthcare Data and Standards - Data Analytics - Data Management and Data Warehousing - HIPAA and Health IT; Evaluation of Healthcare IT Applications - e-health technologies and applications – m-health technologies and applications - Health Information Exchanges

Reference:

- *K. Wager, "Health Care Information Systems: A Practical Approach for Health Care Management", Jossey-Bass; 4th edition, 2017*

3 Cr	Internet of Medical Things (IoMT)								CSE364
E	Lectures	2	Tutorial	2	Lab	0	Semester	--	

Pre-requisites:CSE144

Demystifying the Internet of Things - Setting up IoT work flow - An Overview of IoT Technologies - Aligning IoT and Strategy - Creating an IoT Roadmap for the Future – Programming with Python –- IoT Cloud Infrastructure - Performance and Security in IoT - Building IoT medical applications

Reference:

- *A. Hassanien, "Medical Big Data and Internet of Medical Things: Advances, Challenges and Applications", CRC Press; 1st edition, 2018*

3 Cr	Public Health								BME365
E	Lectures	2	Tutorial	2	Lab	0	Semester	--	

Pre-requisites: BAS115 & BME228

Biostatistics - effect of human exposure to chemicals and their effect on metabolism and related health effects - quantitative and qualitative assessment of health hazards as basis for regulatory policies establishment - Case study

Reference:

- *M. Schneider, "Introduction to Public Health", Jones & Bartlett Learning; 5th edition, 2016*

3 Cr	Opto-electronics								ECE366
E	Lectures	2	Tutorial	2	Lab	0	Semester	--	

Pre-requisites: ECE273

Displays and LASER devices- Luminous intensity - Cathode Luminous - electrical Luminous- Luminous injection - Light emitting diode - Plasma display screens - Liquid crystal displays LCDs- Digital displays- Absorption، emission and radiation of LASER- Feedback optics- Threshold and active mediums of LASER - LASER classes - steady state regime and LASER applications - Photodetector devices (photodetector- thermal detector- photonic devices- optical connectors- photodiodes PN junctions- detector performance- photoemission rate- optical switch)- electro-optic integrated circuits (integrated optics).

Reference:

- *S. Kasap," Optoelectronics & Photonics: Principles & Practices ", Pearson; 2nd edition, 2012*

3 Cr	Pattern Recognition								ECE367
E	Lectures	2	Tutorial	2	Lab	0	Semester	--	

Pre-requisites :ECE396

Introduction - Features - training and learning - Classification - decision tree classifier - rule-based classifier - statistical pattern recognition - supervised learning - non-parametric learning - feature extraction and selection - unsupervised learning

Reference:

- *G. Dougherty, "Pattern Recognition and Classification", Springer, 2013*

3 Cr	Introduction to Deep Learning								ECE421
E	Lectures	2	Tutorial	2	Lab	0	Semester	--	
Pre-requisites: BME345, ECE395									
Introduction to Deep Learning - Deep Computer Vision -Deep Reinforcement Learning - Data Visualization for Machine Learning - Learning and Perception - Deep Sequence Modeling - Deep Generative Models - Limitations and New Frontiers - Biologically Inspired Learning									
Reference: • *S. Skansi, "Introduction to Deep Learning", Springer; 1st edition, 2018*									

3 Cr	Introduction to Nanotechnology								ECE422
E	Lectures	2	Tutorial	2	Lab	0	Semester	--	
Pre-requisites: ECE273									
Introduction to nano technology science - Wave Nature of Light - Dielectric Waveguides and Optical Fibers - Polarization and Modulation of Light – nano plasmonic waveguide – plasmonic sensors – medical applications of nano technology									
Reference: • *J. Ramsden, "Nanotechnology: An Introduction", Elsevier, 2nd edition, 2016*									

3 Cr	Medical and Pharmaceutical Procedures								BME431
E	Lectures	2	Tutorial	2	Lab	0	Semester	--	
Pre-requisites: BME228									
Sterilization regarding: Methods of sterilization، Basis for selection of method of sterilization، Devices used in each method and its technical principle، Evaluation of the success of the sterilization process - Most commonly used instruments and consumables in laboratories – Blood components and medical applications related to it.									
Reference: • *S. Haider, "Quality Operations Procedures for Pharmaceutical, API, and Biotechnology", CRC Press, 1st edition, 2012*									

3 Cr	Fluid Flow in Bio-Systems								BME432
E	Lectures	2	Tutorial	2	Lab	0	Semester	--	
Pre-requisites: BME239									
Introduction to biofluid mechanics - The circulation of blood as a fluid - blood vessels - Pressure and flow in the cardiovascular system-Equation of motion - Newtonian flow in blood vessels - Non-Newtonian flow in blood - Wave phenomena in blood vessels - the effect of curvature، branching and changes in shape/area - Flow in the microcirculation.									
Reference: • *S. Becker, "Heat Transfer and Fluid Flow in Biological Process", Elsevier, 2015*									

3 Cr	Clinical Pathology								BME433
E	Lectures	2	Tutorial	2	Lab	0	Semester	--	
Pre-requisites: BME239									
CBC/chemistry: Various causes of anemia - Factitious results - Endocrine diseases- Inflammatory disease - Renal disease - Coagulopathies - Hepatic disease Methodologies - Toxic insults - Acid-Base/Electrolyte disturbances, Cytology: Inflammatory/infectious - Benign tumors - Carcinomas - Sarcomas - Round cell tumors									
Reference: • *S. Kawthalkar, "Essentials of Clinical Pathology", Jaypee Brothers Medical Publishers (P) Ltd., 1st edition, 2010*									

3 Cr	Industrial Pharmacy								BME434
E	Lectures	2	Tutorial	2	Lab	0	Semester	--	
Pre-requisites: BME228									
Basic techniques used in Pharmaceutical industries: Sterilization، Instrumentation in pharmaceutical industry - Instrumental methods of analysis - .Preformulation studies - Optimization techniques in pharmaceutical formulation and processing - Compaction and compression - Effect of design of agitator system(shape factors) on the manufacturing of liquid products - Bio process - Materials of construction and prevention of corrosion - Production planning & control - Selection and evaluation of packaging materials for Solid /semisolid and liquid products - Finished product release، Quality review – Design، Construction، maintenance and sanitation for materials and products - industrial hazards.									
Reference: • *B. Chandakavathe, "Textbook of Industrial Pharmacy", Studium Press, 1st ed. 2019*									

4.4. Projects and Training

3 Cr	Field Training (1) on BME								BME391
M	Lectures	0	Tutorial	0	Lab	0	Semester	--	
Pre-requisites: Pass level 200									
Training conducted by the student، whether in the university hospitals or in any external institution for a period of at least two weeks and a total number of not less than 75 hours. The training must end with a technical report and a discussion.									

3 Cr	Field Training (2) on BME								BME491
M	Lectures	0	Tutorial	0	Lab	0	Semester	--	
Pre-requisites: Pass level 300									
Training conducted by the student، whether in the university hospitals or in any external institution for a period of at least two weeks and a total number of not less than 75 hours. The training must end with a technical report and a discussion.									

2 Cr	Clinical Engineering								BME392
M	Lectures	1	Tutorial	0	Lab	3	Semester	2	
Pre-requisites: BME239 & BME345									
Introduction to clinical engineering - Product development – testing - usability Clinical trials and research - FDA definitions and approval process - Acute care، anesthesia، hemodialysis - Imaging، radiation therapy، lasers Cardiology، infusion and general medical، laboratory Telehealth، RTLS، special purpose systems - Healthcare facility design & special environments - Radiation safety، MRI safety - EMI/RFI، laser safety Laboratory، electrical، and construction safety، hazardous materials - Sanitation and infection prevention Disaster planning/emergency preparedness codes، standards، regulations، and accreditation									
Reference:									
• *A. Taktak, "Clinical Engineering", Elsevier Ltd., 2nd edition, 2020*									

3 Cr	Project in Biomedical Engineering (1)								BME393
M	Lectures	1	Tutorial	2	Lab	3	Semester	2	
Pre-requisites: Pass level 200									
Completion of a project using all previously learned sciences from different fields in order to solve a realistic problem in a team. The project ends with a technical report and a discussion.									

3 Cr	Project in Biomedical Engineering (2)								BME494
M	Lectures	1	Tutorial	2	Lab	3	Semester	1	
Pre-requisites: Pass level 300									
Completion of a project using all previously learned sciences from different fields in order to solve a realistic problem in a team. The project ends with a technical report and a discussion.									

3 Cr	Project in Biomedical Engineering (3)								BME495
M	Lectures	1	Tutorial	2	Lab	3	Semester	2	
Pre-requisites: Pass level 300									
Completion of a project using all previously learned sciences from different fields in order to solve a realistic problem in a team. The project ends with a technical report and a discussion.									