MILITARY INSTITUTE OF SCIENCE AND TECHNOLOGY (MIST)

SYLLABUS OF

BACHELOR OF SCIENCE IN BIOMEDICAL ENGINEERING

DEPARTMENT OF BIOMEDICAL ENGINEERING (BME)

March 2024

COMMITTEE FOR SYLLABUS REVIEW – BME DEPT, MIST

The undergraduate course curriculum of the Department of Biomedical Engineering (BME), Military Institute of Science and Technology (MIST) has been reviewed by the committee as mentioned below and will be implemented from academic session 2024-2025 (Batch BME-10) and onwards.

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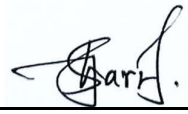
3. 

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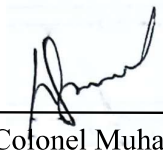
4. 
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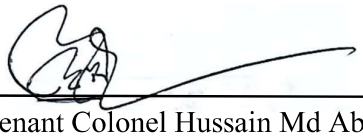
5. 
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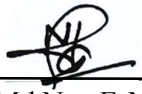
6. 
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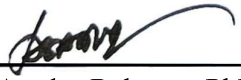
8. 
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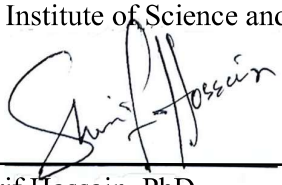
9. 
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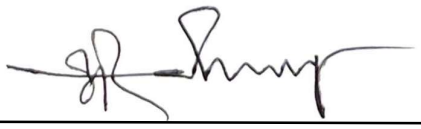
1. 
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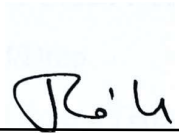
1. 

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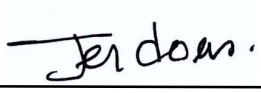
2. 

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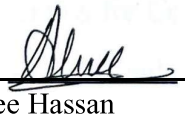

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CONTENTS

CHAPTER 1
GENERAL INFORMATION

1.1 Introduction to MIST

The necessity of establishing a technical institute for the Bangladesh Armed Forces was felt in the late eighties. In the absence of such an institution, officers of Bangladesh Armed Forces had been graduating from Bangladesh University of Engineering and Technology (BUET), Bangladesh Institute of Technology (BIT) and other foreign institutions of science and technology. Intending to meet the increasing demand for the development and dissemination of engineering and technological knowledge, Bangladesh Armed Forces established the Military Institute of Science and Technology (MIST) that promises to provide facilities for higher technical education both for the officers of Bangladesh Armed Forces as well as for civil students from home and abroad. The motto of MIST is ―Technology for Advancement. Founded on 19 April 1998, MIST started its journey on 31 January 1999 by offering a four-year bachelor's degree in Civil Engineering. Bachelor degree in Computer Science Engineering course started in 2001. Bachelor courses in Electrical, Electronic & Communication Engineering and Mechanical Engineering started its journey from 2003. Bachelor of Science program on Aeronautical Engineering (AE) and Naval Architecture and Marine Engineering (NAME) program were started from 2008-2009 and 2012-2013 respectively. Besides, four new departments started their academic session from 2014-2015, i.e. Nuclear Science & Engineering (NSE), Biomedical Engineering (BME), Architecture (Arch) and Environmental, Water Resources & Coastal Engineering (EWCE).

1.2 Vision and Mission of MIST

Vision: To be a centre of excellence for providing advanced quality education in the field of science, engineering, and technology advanced to create diverse quality leaders and professionals and conduct innovative research to meet the national and global needs and challenges.

Mission: MIST is working on the following missions:

a. To develop as a Centre of Excellence for providing comprehensive education and conducting creative and innovative research in diverse disciplines of engineering, technology, science, management and related fields.

b. To produce technologically advanced intellectual leaders and professionals with high moral and ethical values to meet the national and global needs for sustainable socio-economic development.

c. To provide consultancy, advisory and testing services to government, industrial, educational and other organizations to render technical support for widening practical knowledge and to contribute to sustainable socio-economic advancement.

d. To extend collaborative and research activities with national and international communities for life-long learning and long term interaction with the academician and industry.

1.3 Motto and Values of MIST

Motto: As an Institution without gender biasness, MIST is steadily upholding its motto "Technology for Advancement" and remains committed to contributing to the wider spectrum of national educational arena, play a significant role in the development of human resources and gradually pursuing its goal to grow into a 'Centre of 'Excellence'.

Values:

a. Integrity and Respect-We embrace honesty, inclusivity, and equity in all that we do.

b. Honesty and Accountability-Our actions reflect our values, and we are accountable for both.

c. Dedication to Quality and Intellectual Rigour-We strive for excellence with energy, commitment, and passion.

d. Pursuit of Innovation-We cultivate creativity, adaptability, and flexibility in our student, faculty, and staff.

1.4 Eligibility of Students for Admission in MIST

The students must fulfill the following requirements:

a. **Bangladeshi Students.** Minimum qualifications to take part in the admission test are as follows:

1) **SSC Examination (or Equivalent).** The applicant must have passed the examination in Science Group obtaining a minimum GPA of 4.00 (without fourth subject) on the scale of 5.0. Only the applicants who passed SSC or Equivalent Examination in Corresponding current and previous one year can apply.

2) **HSC Examination (or Equivalent).** The applicants passed in current and previous one year must obtain minimum total grade point 17 in four subjects (Mathematics, Physics, Chemistry and English).

3) **GCE ('O' and 'A' Levels or Equivalent)** who have passed HSC or equivalent examination in the current year or one year before the notification for admission can apply.

   a) The applicant who passed in current and previous one year must have qualified with minimum 'B' grade in five subjects including Mathematics, Physics, Chemistry, and English in GCE 'O' Level.

   b) The applicant who passed in current and previous one year must have minimum two 'B' grades and one 'C' grade in Mathematics, Physics, and Chemistry in GCE 'A' Level.

4) Applicants interested in Biomedical Engineering must have Biology at HSC or equivalent level with a minimum grade point of 'A-' / GCE 'A' or equivalent level with a minimum grade point of 'C'.

b. **Foreign Students.** Maximum 3% of overall vacancies available will be kept reserved for the foreign students and will be offered to foreign countries through AFD of the Government of the People's Republic of Bangladesh. Applicants must fulfill the following requirements:

   1) Educational qualifications as applicable for Bangladeshi civil students or equivalent.

   2) Must have security clearance from respective Embassy/High Commission in Bangladesh.

   3) Sex: Male and Female.

** **In the event of non-availability of foreign students, Bangladeshi civil candidates will fill up the vacancies.***

1.5 Number of Seats

The highest number of seats for 04 (Four) years Bachelor Degree in Engineering programs (Unit – A) and 5 (Five) years Bachelor Degree of Architecture programs are as follows:

Allocation of Seats

Ser	Unit	Department	Seats
1	A	Civil Engineering (CE)	120
2		Computer Science and Engineering (CSE)	120

3		Electrical, Electronic & Communication Engineering (EECE)	120
4		Mechanical Engineering (ME)	120
5		Aeronautical Engineering (AE)	100
6		Naval Architecture and Marine Engineering (NAME)	40
7		Biomedical Engineering (BME)	40
8		Nuclear Science and Engineering (NSE)	40
9		Environmental, Water Resources and Coastal Engineering (EWCE)	60
10		Industrial and Production Engineering (IPE)	50
11		Petroleum and Mining Engineering (PME	25
12	**B**	Architecture (Arch)	25
		Total=	860

The total number is 860. In general, about 50% seats will be allocated to military officers. However, in case of the requirement of military students vacancy is less in any particular year, the deficient vacancy will be filled up by civil students. MIST also maintains quota as mentioned below:

Ser	**Quota Allocation**	**Seats**
1	General Candidates	54%
2	Children of Military Personnel	40%
3	Children of Freedom Fighters	2%
4	Tribal Citizen	1%
5	International Students	3%
	Total=	100%

1.6 Admission Procedure

1.6.1 Syllabus for Admission Test.

Admission test will be conducted on the basis of the syllabus of Mathematics, Physics, Chemistry and English (comprehension and functional) subjects of HSC examinations of all boards of secondary and higher secondary school certificates. Admission test will be conducted out of 200 marks and the distribution of marks is given below:

Ser.	Subjects	Marks
a.	Mathematics	90
b.	Physics	70
c.	Chemistry	30
d.	English	10
	Total=	200

1.6.2 Final Selection

Students will be selected on the basis of results of the admission test. The individual choice for selection of departments will be given preference as far as possible. In case of tie in the result of admission test, the difference will be judged on the basis of marks obtained in Mathematics, Physics, Chemistry and English respectively in admission test.

1.6.3 Medical Checkup

Civil candidates selected through admission test will go for medical checkup in MIST/CMH. If the medical authority considers any candidate unfit for study in MIST due to critical/contagious/mental diseases as shown in medical policy of MIST will be declared unsuitable for admission.

1.7 Students Withdrawal Policy

1.7.1 For Poor Academic Performance

The undergraduate (B.Sc.) Engineering programs for all engineering disciplines are planned for 04 regular levels, comprising of 08 regular terms for Architecture program, it is planned for 3 & regular levels, comprising of 10 regular terms. It is expected that all students will

earn degree by clearing all the offered courses in the stipulated time. In case of failure, the following policies will be adopted:

a. Students failing in any course/subject will have to clear/pass the said course/subject by appearing it in supplementary/self-study (for graduating student) examination as per examination policy.

b. Students may also retake the failed subject/course in regular term/short term as per Examination policy.

c. Maximum grading for supplementary/self-study examination etc. of failed subjects will be B+ as per examination policy.

d. One student can retake/reappear in a failed subject/course only twice. However, with the Permission of Academic Council of MIST, a student may be allowed for third time as last chance.

e. In case of sickness, which leads to missing of more than 40% classes or miss term final examination (supported by requisite medical documents), students may be allowed to withdraw temporarily from that term and repeat the whole level with the regular level in the next academic session, subject to the approval of Academic Council, MIST. However, he/she has to complete the whole undergraduate program within 06 (six) academic years (for Architecture 07 academic years) from the date of his/her registration.

f. Minimum credit requirement for the award of bachelor's degree in Engineering (B.Sc. Engg) and Architecture (B. Arch) will be decided by the respective department as per existing rules. However, the minimum CGPA requirement for obtaining a bachelor degree in engineering and Architecture is 2.20.

g. Whatever may be the cases, students have to complete the whole undergraduate Program within 06 (six) academic years from the date of registration.

h. All other terms and condition of MIST Examination Policy remain valid.

1.7.2 Withdrawal on Disciplinary Ground

a. Unfair Means. Adoption of unfair means may result in expulsion of a student from the programme and so from the Institution. The Academic Council will authorize such expulsion on the basis of recommendation of the Disciplinary Committee, MIST and as per policy approved by the affiliating university. Following would be considered as unfair means adopted during examinations and other contexts:

- Communicating with fellow students for obtaining help in the examination

- Copying from another student's script/ report /paper
- Copying from desk or palm of a hand or other incrimination documents
- Possession of any incriminating document whether used or not

b. **Influencing Grades.** Academic Council may expel/withdraw any student for approaching directly or indirectly in any form to influence a teacher or MIST authority for grades.

c. **Other Indiscipline Behaviors.** Academic Council may withdraw/expel any student on disciplinary ground if any form of indiscipline or unruly behavior is seen in him/her which may disrupt the academic environment/program or is considered detrimental to ' 'MIST's image.

d. **Immediate Action by the Disciplinary Committee of MIST.** The Disciplinary Committee, MIST may take immediate disciplinary action against any student of the institution. But later the approval of BUP has to be taken. In case of withdrawal/expulsion, the matter will have to be referred later to the next academic Council, MIST.

1.7.3 Withdrawal on Own Accord.

a. **Permanent Withdrawal.** A student who has already completed some courses and has not performed satisfactorily may apply for a withdrawal.

b. **Temporary Withdrawal.** A student, if he/she applies, may be allowed to withdraw temporarily from the program, subject to approval of Academic Council of MIST, but he/she has to complete the whole program within 06 (six) academic years (for Architecture 07 academic years) from the date of his/her registration.

c. **Permanent Expulsion** The term 'Permanent Expulsion' means expulsion permanently from the institution on disciplinary ground. A student, if expelled permanently will never be allowed to re-enter the course or similar program in MIST and be subjected to other terms and conditions as set by the authority while approving the permanent expulsion order.

d. **Temporary Expulsion** The term 'Temporary Expulsion' means expulsion from an academic course/program for a certain period on disciplinary ground. A student, if expelled temporarily, may be allowed to re-enter the course/program on expiry of the punishment period and on fulfilment of other terms and conditions (if any) as set by the authority while approving the temporary expulsion order.

CHAPTER 2

RULES AND REGULATIONS FOR UNDERGRADUATE PROGRAMS AT MIST

2.1 Introduction

MIST has introduced course system for undergraduate studies from the academic session 2017-18. Therefore, the rules and regulations mentioned in this paper will be applicable to students for administering undergraduate curriculum through the Course System. This will be introduced with an aim of creating a continuous, even and consistent workload throughout the term for the students.

2.2 The Course System

a. The salient features of the Course System are as follows:

Number of theory courses will be generally 5 in each term. However, with the recommendation of course coordinator and Head of the Department, Commandant MIST may allow relaxation in this regard. This relaxation is to be reported to Academic Council of MIST.

1) Students will not face any level repeat for failing
2) Students will get scope to improve their grading
3) Introduction of more optional courses to enable the students to select courses according to their individual needs and preferences
4) Continuous evaluation of 'students' performance
5) Promotion of student-teacher interaction and contact

b. Beside the professional courses pertaining to each discipline, the undergraduate curriculum gives a strong emphasis on acquiring thorough knowledge in the basic sciences of mathematics, physics and chemistry. Due importance is also given on the study of several subjects in humanities and social sciences.

c. The first two years of ' 'bachelor's degree programs generally consist of courses on basic engineering, general science and humanities subjects; while the third and subsequent years focus on specific disciplines.

2.3 Number of Terms in a Year

There will be two terms Spring Term (Jan-Jun) and Fall Term (Jul-Dec) in an academic year.

2.4 Duration of Terms

The duration of each of Spring Term and Fall Term (maximum 22 weeks) may be as under:

Ser	Events	Duration
1.	Classes before Midterm	7 weeks
2.	Midterm Vacation	1 week
3.	Classes after Midterm	7 weeks
4.	Makeup Classes and Preparatory leave	2/3 weeks
5.	Term Final Examination	2/3 weeks
6.	Term End Vacation	1/2 weeks

2.5 Course Pattern and Credit Structure

The undergraduate program is covered by a set of theoretical courses along with a set of laboratories (sessional) courses to support them.

2.6 Course Designation System

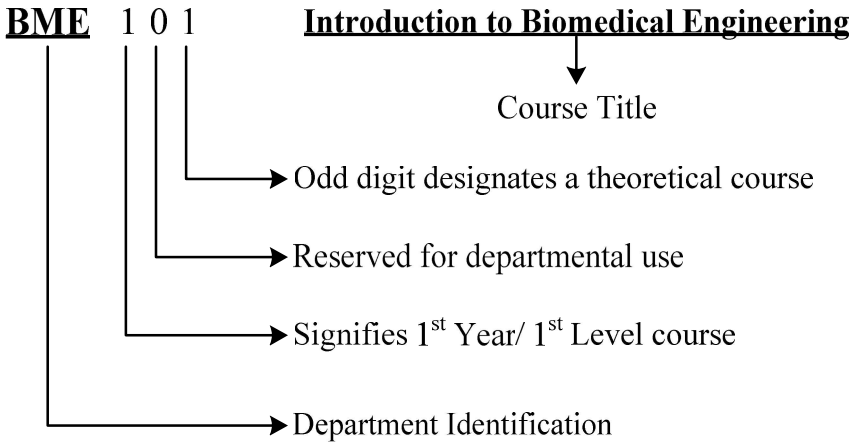
Each course is designated by a maximum of four-letter code identifying the department offering the course followed by a three-digit number having the following interpretation:

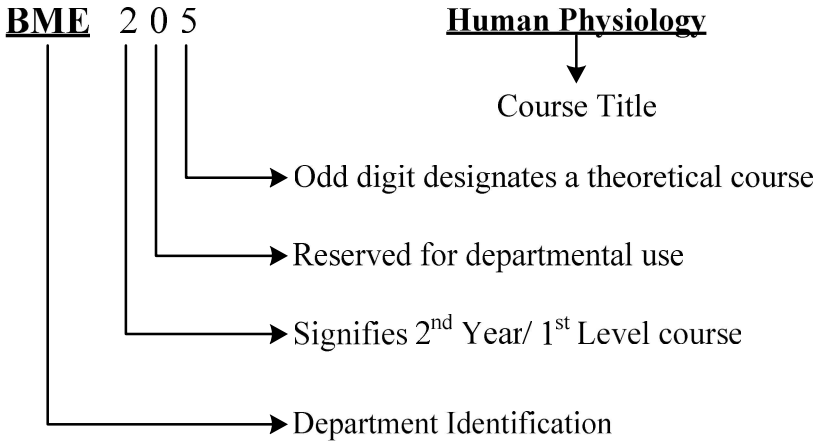
a. The first digit corresponds to the year/level in which the course is normally taken by the students.

b. The second digit is reserved for departmental use. It usually identifies a specific area/group of study within the department.

c. The last digit is an odd number for theoretical courses and an even number for sessional courses.

The course designation system is illustrated as follows:





2.7 Assignment of Credits

The assignment of credits to a theoretical course follows a different rule from that of a sessional course.

a. **Theoretical Courses:** One lecture per week per term is equivalent to one credit.

b. **Sessional Courses:** Credits for sessional courses is half of the class hours per week per term.

c. Credits are also assigned to project and thesis work taken by the students. The amount of credits assigned to such work varies from one discipline to another.

2.8 Types of Courses

The types of courses included in the undergraduate curricula are divided into the following groups:

a. Core Courses: In each discipline, a number of courses are identified as core courses, which form the nucleus of the respective bachelor's degree program. A student has to complete all designated core courses of his/her discipline.

b. Prerequisite Courses: Some of the core courses are identified as prerequisite courses for a specific subject.

c. Optional Courses: Apart from the core courses, the students can choose from the set of optional courses. A required number of optional courses from a specified group have to be chosen.

2.9 Course Offering and Instruction

a. The courses to be offered in a particular term are announced and published in the Course Catalog along with the tentative Term Schedule before the end of the previous term. The courses to be offered in any term will be decided by Board of Undergraduate Studies (BUGS) of the respective department.

b. Each course is conducted by a course teacher who is responsible for maintaining the expected standard of the course and for the assessment of 'students' performance. Depending on the strength of registered students (i.e. on the number of students) enrolled for the course, the teacher concerned might have course associates and Teaching Assistants (TA) to aid in teaching and assessment.

2.10 Teacher Student Interaction

The new course system encourages students to come in close contact with the teachers. For promotion of a high level of teacher-student interaction, each student is assigned to an adviser and the student is free to discuss all academic matters with his/her adviser. Students are also encouraged to meet any time with other teachers for help and guidance in academic matters. However, students are not allowed to interact with teachers after the moderation of questions.

2.11 Student's Adviser

a. One adviser is normally appointed for a group of students by the BUGS of the concerned department. The adviser advises each student about the courses to be taken in each term by discussing the academic program of that particular term with the student.

b. However, it is also the student's responsibility to keep regular contact with his/her adviser who will review and eventually approve the ' 'student's specific plan of study and monitor subsequent progress of the student.

c. For a student of second and subsequent terms, the number and nature of courses for which he/she can register are decided on the basis of academic performance during the previous term. The adviser may permit the student to drop one or more courses based on previous academic performance.

2.12 Course Registration

Any student who uses classroom, laboratory facilities or faculty-time is required to register formally. Upon admission to the MIST, students are assigned to advisers. These advisers guide the students in choosing and registering courses.

2.12.1 Registration Procedure

At the commencement of each term, each student has to register for courses in consultation with and under the guidance of his/her adviser. The date, time and venue of registration are announced in advance by the ' 'Registrar's Office. Counseling and advising are accomplished at this time. It is absolutely essential that all the students be present for registration at the specified time.

2.12.2 Pre-conditions for Registration

a. For first year students, department-wise enrollment/admission is mandatory prior to registration. At the beginning of the first term, an orientation program will be conducted for them where they are handed over with the registration package on submission of the enrolment slip.

b. Any student, other than the new batch, with outstanding dues to the MIST or a hall of residence is not permitted to register. Each student must clear their dues and obtain a clearance certificate, upon production of which, he/she will be given necessary Course Registration Forms to perform course registration.

c. A student is allowed to register in a particular course subject to the class capacity constraints and satisfaction of prerequisite courses. However, even if a student fails in a prerequisite course in any term, the concerned department (BUGS) may allow him/her to register for a course which depends upon the prerequisite course provided that his/her attendance and performance in the continuous assessment of the mentioned prerequisite course is found to be satisfactory.

2.12.3 Registration Deadline.

Each student must register for the courses to be taken before the commencement of each term. Late registration is permitted only during the first week of classes. Late registration after this date will not be accepted unless the student submits a written application to the registrar through the concerned Head of the department explaining the reasons for delay. Acceptable reasons may be medical problems with supporting documents from the Medical Officer of MIST or some other academic commitments that prohibit enrollment prior to the last date of registration.

2.12.4 Penalty for Late Registration

Students who fail to register during the designated dates for registration are charged a late registration fee of Tk. 100.00 (One hundred only) per credit hours. Penalty for late registration will not be waived.

2.12.5 Limits on the Credit Hours to be taken

a. A student should be enrolled for at least 15 credit hours and is allowed to take a maximum of 24 credit hours. Relaxation on minimum credit hours may be allowed. A student must enroll for the sessional courses prescribed in a particular term within the allowable credit hour limits.

b. In special cases where it is not possible to allot the minimum required 15 credit hours to a student, the concerned department (BUGS) may permit with the approval of the Comdt, a lesser number of credit hours to suit individual requirements. Such cases are also applicable to students of Level 4 requiring less than 15 credit hours for graduation.

2.12.6 Course Add/Drop

a. A student has some limited options to add or drop courses from the registration list. Addition of courses is allowed only within the first two weeks of a regular term and only during the first week of a short term. Dropping a course is permitted within the first four weeks of a regular term and two weeks of a short term.

b. Any student willing to add or drop courses has to fill up a Course Adjustment Form. This also has to be done in consultation with and under the guidance of the ' 'student's respective adviser. The original copy of the Course Adjustment Form has to be submitted to the ' 'Registrar's Office, where the required numbers of photocopies are made for distribution to the concerned adviser, Head, Dean, Controller of Examinations and the student.

c. All changes must be approved by the adviser and the Head of the concerned department. The Course Adjustment Form has to be submitted after being signed by the concerned persons.

2.12.7 Withdrawal from a Term

If a student is unable to complete the Term Final Examination due to serious illness or serious accident, he/she may apply to the Head of the degree-awarding department for total withdrawal from the term before commencement of term final examination. However, application may be considered during term final examination in special case. The application must be supported by a medical certificate from the Medical Officer of MIST. The concerned student may opt for retaining the sessional courses of the term. The Academic Council will take the final decision about such applications. However, the total duration for graduation will not exceed 6 academic years.

2.13 The Grading System

The total performance of a student in a given course is based on a scheme of continuous assessment, for theory courses this continuous assessment is made through a set of quizzes, class tests, class evaluation, class participation, homework assignment and a term final examination. The assessments for sessional courses are made by evaluating performance of the student at work during the class, viva-voce during laboratory hours and quizzes. Besides that, at the end there will be a final lab test. Each course has a certain number of credits, which describes its corresponding weightages. A student's performance is measured by the number of credits completed satisfactorily and by the weighted average of the grade points earned. A minimum grade point average (GPA) is essential for satisfactory progress. A minimum number of earned credits also have to be acquired in order to qualify for the degree. Letter grades and corresponding grade points will be given as follows:

Numerical Markings	Grade	Grade Points
80% and above	A+	4.00
75% to below 80%	A	3.75
70% to below 75%	A-	3.50
65% to below 70%	B+	3.25
60% to below 65%	B	3.00
55% to below 60%	B-	2.75
50% to below 55%	C+	2.50
45% to below 50%	C	2.25
40% to below 45%	D	2.00
below 40%	F*	0.00
Incomplete	I	-
Withdrawal	W	-
Capstone Project/Thesis Continuation	X	-

*Subject in which the student gets F grade shall not be regarded as earned credit hours for the calculation of Grade Point Average (GPA).

2.14 Distribution of Marks

2.14.1 Theory

Forty percent (40%) of marks of a theoretical course shall be allotted for continuous assessment, i.e. quizzes, home assignments, class tests, observations/ class participation and class attendance. This mark must be submitted to Office of the Controller of Examinations before commencement of final exam. The rest of the marks will be allotted to the Term Final Examination. The duration of final examination will be three (03) hours. The scheme of continuous assessment that a particular teacher would follow for a course will be announced on the first day of the classes.

Distribution of marks for a given course per credit is as follows	**Marks**
Class Performance	5%
Class Attendance	5%
Class Test/ Assignment	20%
Midterm Assessment (Exam/Project)	10%
Final Examination (Section A & B)	60%
Total =	100%

Note:

a. In final exam, each section can be used for achieving not more than two course outcomes (COs). The remaining COs should be attained from mid-term assessment or class tests. Course teacher has to inform the student the beginning of the terms.

b. Course teacher of a particular course has to inform the department whether he/she wants to assess mid-term through exam or project within first two weeks of beginning of a term. The duration of mid-term examination should not be more than 50 minutes which has to be conducted in between 6th to 9th week of a semester. If mid-term assessment is done through project, then there should be project report and presentation.

c. The weightage of class performance can be assessed through checking attentiveness during classes or arranging unnoticed pop quizzes.

d. The number of class tests shall be n for 3.0 and above credit courses and (n-1) shall be considered for grading where n is the number of credits of the course. However, for courses having credits below 3.0, the considered class tests shall be 2 out of 3.

e. All class test will carry 20 marks each. Exam software system will finally convert these achieved marks into total class test marks as per credit hour. i.e for n=1(20), n=2 (40), n=3 (60), n=4(80), etc.

f. Irrespective of the result of the continuous assessment (class performance, class test, mid-term assessment), a student has to appear in the final examination (where applicable) for qualifying/passing the concern course/ subject.

2.14.2 Laboratory/Sessional/Practical Examinations

Laboratory/ Sessional courses are designed and conducted by the concerned departments. Examination on sessional/practical subjects will be conducted by the respective department before the commencement of term final examination. The date of practical examination will be fixed by

the respective department. Students will be evaluated in the laboratory/ sessional courses on the basis of the followings:

a.	Conduct of Lab Tests/Class Performance	25%
b.	Report Writing/ Programming	15%
c.	Mid-Term Evaluation (exam/project/assignment)	20%
d.	Final Evaluation (exam/project/assignment)	30%
e.	Viva Voce/ Presentation	10%
	Total Percentage=	100%

Note: the above distribution of percentage is a general guideline. Department can rearrange to some extent if required.

2.14.3 Sessional Course in English

The distribution will be as under:

a.	Class performance/observation	10
b.	Written Assignment	15
c.	Oral Performance	25
d.	Listening Skill	10
e.	Group Presentation	30
f.	Viva Voce	10
	Total Percentage=	100%

2.14.4 Class Attendance

Class attendance may be considered as a part of continuous assessment. No mark should be allotted for attending classes.

Collegiate and Non-collegiate

Students having class attendance of 85% or above in individual subject will be treated as collegiate, and less than 85% and up to 70% will be treated as non-collegiate in that subject. The non-collegiate student(s) may be allowed to appear at the examination subject to payment of non-

collegiate fee/fine of an amount fixed by MIST/BUP. Students having class attendance below 70% will be treated as dis-collegiate and will not be allowed to appear at the examination and treated as fail. But in a special case such students may be allowed to appear in the examination with the permission of Commandant and it must be approved by the Academic Council.

2.14.5 Calculation of GPA

Grade Point Average (GPA) is the weighted average of the grade points obtained of all the courses passed/completed by a student. For example, if a student passes/completes *n* courses in a term having credits of C_1, C_2, ..., C_n and his grade points in these courses are G_1, G_2, ..., G_n, respectively, then

$$GPA = \frac{Grade\ points\ earned\ in\ the\ semester}{Credits\ completed\ in\ the\ semester}$$

$$= \frac{Summation\ of\ (Credit\ hours\ in\ a\ course * Grade\ point\ earned\ in\ that\ course)}{Total\ number\ of\ credit\ hours\ completed}$$

$$= \frac{\sum_{i=1}^{n} Ci * Gi}{\sum_{i=1}^{n} Ci}$$

The Cumulative Grade Point Average (CGPA) is the weighted average of the GPA obtained in all the terms passed/completed by a student. For example, if a student passes/ completes n terms having total credits of TC_1, TC_2, ... , TC_n and his GPA in these terms are GPA_1, GPA_2,... , GPA_n, respectively then

$$CGPA = \frac{\sum_{i=1}^{n} TCi * GPAi}{\sum_{i=1}^{n} TCi}$$

Numerical Example

Suppose a student has completed eight courses in a term and obtained the following grades:

Course	Credits, C_i	Grade	Grade, G_i	Points, C_iG_i
BME 101	2.0	A-	3.50	7.00
PHY 125	3.0	A+	4.00	12.00

PHY 128	1.5	A	3.75	5.625
CHEM 103	3.0	B	3.00	9.00
CHEM 104	1.5	B-	2.75	4.125
MATH 101	3.0	A+	4.00	12.00
LANG 102	1.5	A	3.75	5.625
GES 101	2.0	A+	4.00	8.00
GEBS 101	2.0	A-	3.50	7.00
Total	19.50			70.375

GPA = 70.375/19.50 = 3.60

Suppose a student has completed four terms and obtained the following GPA.

Level	**Term**	**Credit Earned, TC_i**	**Hours GPA Earned, GPA_i**	**$GPA_i \times TC_i$**
1	1	19.50	3.73	72.73
1	2	22.50	3.93	88.42
2	1	21.50	3.96	85.14
2	2	20.50	4.00	82.00
Total		**84.00**		328.30

CGPA = 328.30/84.00 = 3.90

2.14.6 Impacts of Grade Earned

d. The courses in which a student has earned a "'D' or a higher grade will be counted as credits earned by him/her. Any course in which a student has obtained an "'F' grade will not be counted towards his/her earned credits or GPA calculation. However, the "'F' grade will remain permanently on the Grade Sheet and the Transcript.

e. A student who obtains an "'F' grade in a core course will have to repeat that particular course. However, if a student gets an "'F' in an optional course, he/she may choose to repeat that course or take a substitute course if available. When a student will repeat a course in which he/she has previously obtained an "F', he/she will not be eligible to get a grade better than 'B+"" in that repeated course.

f. If a student obtains a grade lower than 'B+"" in a particular course he/she will be allowed to repeat the course only once for the purpose of grade improvement. However, he/she will not be eligible to get a grade better than 'B+"" for an improvement course.

g. A student will be permitted to repeat for grade improvement purposes a maximum of 6 courses in BSc. Engineering programs and a maximum of 7 courses in B. Arch. program.

h. If a student obtains a 'B+"" or a better grade in any course he/she will not be allowed to repeat the course for the purpose of grade improvement.

2.15 Classification of Students

At MIST, regular students are classified according to the number of credit hours completed/ earned towards a degree. The following classification applies to all the students:

Level	**Credit Hours Earned**	
	Engineering	***Architecture***
Level 1	0.0 to 36.0	0.0 to 34.0
Level 2	More than 36.0 to 72.0	More than 34.0 to 72.0
Level 3	More than 72.0 to 108.0	More than 72.0 to 110.0
Level 4	More than 108.0	More than 110.0 to 147.0
Level 5		More than 147.0

However, before the commencement of each term all students other than new batch are classified into three categories:

a. Category 1: This category consists of students who have passed all the courses described for the term. A student belonging to this category will be eligible to register for all courses prescribed for the upcoming term.

b. Category 2: This category consists of students who have earned a minimum of15 credits but do not belong to category 1. A student belonging to this category is advised to take at least one course less since he might have to register for one or more backlog courses as prescribed by his/her adviser.

c. Category 3: This category consists of students who have failed to earn the minimum required 15 credits in the previous term. A student belonging to this category is advised to take at least two courses less than a category 1 student subject to the constraint of registering at least 15 credits. However, he will also be required to register for backlog courses as prescribed by the adviser.

2.15.1 Definition of Graduating Student

Graduating students are those students who will have ≤ 24 credit hour for completing the degree requirement.

2.16 Performance Evaluation

a. The performance of a student will be evaluated in terms of two indices, viz. Term Grade Point Average and Cumulative Grade Point Average which is the grade average for all the terms completed.

b. Students will be considered to be making normal progress toward a degree if their Cumulative Grade Point Average (CGPA) for all work attempted is 2.20 or higher. Students who regularly maintain a term GPA of 2.20 or better are making good progress toward the degrees and are in good standing with MIST. Students who fail to maintain this minimum rate of progress will not be in good standing. This can happen when any one of the following conditions exists:

1) The term GPA falls below 2.20.

2) The Cumulative Grade Point Average (CGPA) falls below 2.20.

3) The earned number of credits falls below 15 times the number of terms attended.

c. All such students can make up their deficiencies in GPA and credit requirements by completing courses in the subsequent term(s) and backlog courses, if there are any, with better grades. When the minimum GPA and credit requirements are achieved the student is again returned to good standing.

2.17 Application for Graduation and Award of Degree

A student who has fulfilled all the academic requirements for 'Bachelor's degree will have to apply to the Controller of Examinations through his/her Adviser for graduation. Provisional Degree will be awarded by BUP on completion of credit and GPA requirements.

2.17.1 Minimum Earned Credit and GPA Requirement for Obtaining Degree

a. Minimum credit hour requirements for the award of Bachelor’s degree in engineering (BSc Engg) and architecture (B Arch) will be decided by the respective department (BUGS). However, the syllabus of all BSc engineering prog must be of minimum 157 credit hours or more and for architecture prog minimum 189 credit hours or more. A student must earnsearn minimum credit hour set in the syllabus by the concerned

department for qualifying Bachelor's Degree. The minimum CGPA requirement for obtaining a Bachelor's degree in engineering and architecture is 2.20.

b. A student may take additional courses with the consent of his/her Adviser in order to raise CGPA, but he/she may take a maximum of 15 such additional credits in engineering and 18 such additional credits in architecture beyond respective credit-hour requirements for Bachelor's degree during his/her entire period of study.

2.17.2 Minimum Earned Credit and GPA Requirement for Obtaining Degree

Minimum credit hour requirements for the award of bachelor's degree in engineering (B.Sc. Engineering) and other discipline will be decided as per existing rules. The minimum GPA requirement for obtaining a Bachelor's degree in Engineering and Architecture is 2.20.

2.18 Time Limits for Completion of Bachelor's Degree

A student must complete his studies within a maximum period of six years for engineering and seven years for architecture.

2.19 Attendance, Conduct and Discipline

MIST has strict rules regarding the issues of attendance in class and discipline.

a. **Attendance:** All students are expected to attend classes regularly. The university believes that attendance is necessary for effective learning. The first responsibility of a student is to attend classes regularly and one is required to attend the classes as per MIST rules.

b. **Conduct and Discipline:** During their stay in MIST all students are required to abide by the existing rules, regulations and code of conduct. Students are strictly forbidden to form or be members of student organization or political party, club, society etc., other than those set up by MIST authority in order to enhance ' 'student's physical, intellectual, moral and ethical development. Zero tolerance in regards of sexual abuse and harassment in any forms and drug abuse and addiction are strictly observed in the campus.

2.20 Teacher-Student Interaction

The academic system in MIST encourages students to come in close contact with the teachers. For promotion of high level of teacher-student's interaction, a course coordinator is assigned to each course. Students are free to discuss with CC about all academic matters. Students are also encouraged to meet other teachers any time for help and guidance for academic matters. Heads of

the departments, Director of Administration, Director of Students Welfare (DSW), Dean and Commandant address the students at some intervals. More so, monthly Commandant's Parade is organized in MIST where all faculty members, staff and students are formed up, thereby increasing teacher-student interaction.

2.21 Absence During a Term

A student should not be absent from quizzes, tests, etc. during the term. Such absence will naturally lead to reduction in points/marks, which count towards the final grade. Absence in the Term Final Examination will result in an F grade in the corresponding course. A student who has been absent for short periods, up to a maximum of three weeks due to illness, should approach the course teacher(s) or the course coordinator(s) for make-up quizzes or assignments immediately upon return to classes. Such request has to be supported by medical certificate from competent authority (e.g. CMH/MIST Medical Officer).

2.22 Recognition of Performance

As recognition of performance and ensure continued studies MIST awards medals, scholarships and stipends will be given as per existing rules and practices.

2.23 Types of Different Examination

Following different types of final Examinations will be conducted in MIST to evaluate the students of Undergraduate Programs:

a. **Term Final Examination:** At the end of each normal term (after 22week or so), Term Final Examination will be held. Students will appear in the Term Final Examination for all the theory courses they have taken in the Term.

b. **Supplementary Examination:** It will take place twice in a year. Supplementary-I is defined as provision of giving exam in the first week of Spring Term (Jan-Jun)/Fall Term (Jul-Dec) end break and Supplementary-II in the first week of Fall Term (Jul-Dec)/ Spring Term (Jan-Jun) end break, respectively. Students will be allowed to register for a maximum of two theory courses (Failed/ Improvement) in Supplementary-I and maximum of one theory course (Failed/ Improvement) in Supplementary-II.

c. **Improvement Examination:** It will be taken during Supplementary-I and Supplementary-II Examination. Questions will be same as the question of the regular examination of that Supplementary Examination (if any). Student can take maximum two subjects at a time (two subjects in Supplementary-I and one subject in Supplementary-II) and maximum 6 subjects in the whole academic duration. If a student obtains a grade lower than 'B+' in a course, he/she will be allowed to repeat the course only once for grade improvement.

However, he/she will not be eligible to get a grade better than 'B+' for an improvement course. Among the previous result and improvement examination result, best one will be considered as final result for an individual student. However, performance of all examination i.e. previous to improvement examination shall be reflected in the transcript.

2.24 Rules of Different Examinations

2.24.1 Term Final Examination

Following rules to be followed:

a. Registration to be completed before commencement of the class. A student has to register his desired courses paying registration, examination fee and other related fees.

b. Late registration will be allowed without penalty within first one week of the term.

c. Within 1st two weeks of a term a student can Add/Drop course/courses. To add a course, in the 3rd week, one has to register the course by paying additional fees. To drop a course, one has to apply within three weeks and paid fees will be adjusted/ refunded. If anyone wants to drop a course after three weeks and within 4 weeks, that will be permitted but paid fees will not be refunded in that case.

d. Registrar office will finalize registration of all courses within 7 (seven) weeks, issue registration slip and that will be followed by issuing Admit Card.

e. Term Final Examination to be conducted in the 18-20th week of the term as per approved Academic Calendar.

2.24.2 Supplementary Examination

Following rules to be followed:

a. Supplementary-I is defined as provision of giving exam in the first week of Spring Term (Jan-Jun) /Fall Term (Jul-Dec) end break and Supplementary-II in the first week of Fall Term (Jul-Dec) / Spring Term (Jan-Jun) end break, respectively.

b. Students will be allowed to register for a maximum of two theory courses (Failed/ Improvement) in Supplementary-I and maximum of one theory course (Failed/ Improvement) in Supplementary-II.

c. No class will be conducted.

d. 40% marks will be considered from the previous exams.

e. Maximum grading in Supplementary Exam will be 'B+'.

f. No Sessional Exam will be conducted.

g. Examination will be taken on 60% marks like Term Final Examination.

h. If a student fails in a course more than once in regular terms, then for calculating 40% marks, the best one of all continuous assessment marks will be counted.

i. If anyone fails in the Laboratory/ Sessional course, that course cannot be taken in the supplementary examination.

j. If any student fails in a course, he can clear the course retaking it second time or, he can clear the examination appearing at the Supplementary Examination as well. Anyone fails twice in a course, can only retake it in the regular term for appearing third time. But anyone fails even after appearing third time, he/she has to take approval of Academic Council of MIST for appearing 4th (last) time in a course and need to pay extra financial penalty. If any student fails even 4th time in a course, will not be allowed to appear anymore in this same course.

k. Registration of Supplementary-I Exam to be done within 5th week after completion of fall Term (Jul-Dec) and registration of Supplementary-II Exam to be done within the mid-term break of Spring Term (Jan-Jun), paying all the required fees.

l. There will be no provision for add/drop courses after registration.

m. **Thesis:** if a student cannot complete thesis in two consecutive terms, with the recommendation of the supervisor, he/she may continue for next one/two term within six academic years.

2.24.3 Improvement Examination

Following rules to be followed:

a. Improvement Examination is to be taken during the Supplementary-I and II examinations.

b. For Improvement Examination, registration is to be done during the registration of Supplementary-I and Supplementary-II Examinations by paying all the fees.

c. Question Setting, Moderation and Result Publication to be done with courses of Supplementary-I and Supplementary-II Examinations.

d. Any student gets a grading below 'B+' and desires to improve that course, he will be allowed to appear the Improvement Examination for that particular course.

e. Highest grade of Improvement Examination will be 'B+'.

f. One student is allowed to appear at Improvement Exam in 6 (six) courses in his whole graduation period taking maximum two courses at a time (two courses at Supplementary-I and one course at Supplementary-II).

2.25 Irregular Graduation

If any graduating student clears his/her failed course in Term-1 (Spring) and his graduation requirements are fulfilled, his graduation will be effective from the result publication date of Term-1 (Spring) and that student will be allowed to apply for provisional certificate.

2.26 Minimum Earned Credit and CGPA Requirement for Obtaining Degree

The requirements for award of engineering degree are as follows:

a. Completion of the courses for the minimum required credits of 157 (or as specified in a particular department) in a maximum period of six academic years.

b. Appearing at the final examination in all the required courses as per syllabus of the program.

c. Scoring a CGPA of 2.2 or above.

2.27 Consequences of Failing in Sessional Courses

Any student failing in any sessional course must re-take that sessional course when offered by the department in any next Regular Term. No Supplementary exam is allowed for sessional course.

2.28 Withdrawal for Poor Performance

A student to remain in reasonable standing must maintain a minimum CGPA of 2.20. Failure to secure/achieve minimum CGPA of 2.20 in two consecutive levels will also lead to withdrawal of the student. A student who fails to maintain a CGPA of 2.20 at the end of a level, but obtains 2.00 or more, will be placed on probation. Failure by a student placed on probation to raise the CGPA to 2.20 in the next level will lead to his withdrawal from the Program. A student failing to maintain a CGPA of 2.20 at the end of the level-4 shall be allowed to repeat courses of the level-4 in which he earned 'C' grades or below. This opportunity will be given only once. Such a student failing to raise CGPA to 2.2 after repeating the courses will be withdrawn from the Program (For further detail 'MIST Withdrawal Policy' may be consulted).

a. **Voluntary withdrawal for Sickness.** In case of sickness which leads to missing of more than 40% class or miss term final examination (supported by requisite medical documents), students may be allowed to withdraw from that term subject to the approval of the Academic Council of MIST. Students may retain sessional courses of that term if applies and approved by Academic council. 'VW' as grading of each course to be reflected in concerned tabulation sheet, grade sheet and transcript.

b. **Class Tests.** The number of class tests shall be n for 3.0 and above credit courses and (n-1 shall be considered for grading where n is the number of credits of the course. However, for courses having credits below 3.0, the considered class tests shall be 2 out of 3. Class test will be conducted by the subject teacher. Duration of class test should not be more than 30 minutes. Course teacher must announce results within 10 days of holding the examination. Checked script will be shown to the students. If a student misses the class test for acceptable reason the course teacher my take the test of the student.

c. MIST is committed in conferring degrees to the students in time which plays a very vital role in steering all the academic activities in any university/ institute. At the beginning MIST conducted all its examinations under the examination section of the University of Dhaka. In June 2008, MIST got affiliation with BUP. Since then MIST has been conducting all its examinations under the control and authority of BUP. For the need of time, former MIST examination policy was reviewed several times. Present review committee has made necessary amendment/ addition/ deletion to suit the proposed course system. This policy may be reviewed every after 05 (five) years or as and when felt necessary by the authority of MIST.

2.29 SUMMARY OF MIST EXAMINATION POLICY-2020

Serial	Examination Type	Session	Number of Theory Courses	Maximum Grading	Assessment Percentage	Examination Schedule	Courses	Registration Schedule
1	Regular	Spring Term (Jan-Jun) and Fall Term (Jul-Dec)	Maximum 6 Theory Courses	A+	Assessment on 100%	Regular Examination	Regular	Regular
2	Retake	Spring Term (Jan-Jun) and Fall Term (Jul-Dec)		B+				
3	Supplementary-I (Fail/Improvement)	Spring Term (Jan-Jun)	Maximum 2 Theory	B+	Assessment on 60%	1st week of Spring Term (Jan-Jun)/ Fall Term (Jul-Dec) End Break	Courses of immediate past terms included	5th week after completion of Fall Term (Previous Year)
4	Supplementary-II (Fail/Improvement)	Fall Term (Jul-Dec)	Maximum 1 Theory	B+	Assessment on 60%	1st week of Fall Term (Jul-Dec)/ Spring Term (Jan-Jun) End Break	Courses of immediate past terms not included	Mid-Term Break of Spring (Jan-Jun) Term (March)

1. Maximum 24 credit hour in one regular term (excluding Supplementary Exams).
2. Students may register maximum upto 7 (seven) theory courses in exceptional case, if department can accommodate within 24 credit hour.
3. Students can register maximum 6 (six) theory courses for improvement in his whole academic period.
4. Supplementary-I Exam to be considered as part of previous Academic Year.
5. Student appearing in Supplementary-I shall not be included in current graduation ceremony.

CHAPTER 3

DEPARTMENT OF BIOMEDICAL ENGINEERING (BME)

3.1 Introduction to the Program

The Department of Biomedical Engineering, MIST, was founded in 2014 and started the academic program of the pioneer batch of Undergraduate Biomedical Engineers in the country. The B.Sc Program commenced on 1st February, 2015 with 41 students. The M.Sc Program commenced on 4th November 2015 with 5 students. Currently, there are a total of 161 students in the B.Sc Program and a total of 37 students in the M.Sc Program. Biomedical Engineering (BME) is an interdisciplinary field that combines the design and problem-solving skills of engineering with medical and biological sciences to advance healthcare treatment. Deeply interdisciplinary, biomedical engineering applies modern approaches from the experimental life sciences in conjunction with theoretical and computational methods from engineering, mathematics, and computer science to the solution of biomedical problems of fundamental importance, such as human health. This field seeks to close the gap between engineering and medicine, combining the design and problem-solving skills of engineering with medical and biological sciences to advance healthcare treatment, including diagnosis, monitoring, and therapy. The current focus of the BME Department includes the development of biocompatible implants and prostheses, various diagnostic and therapeutic medical devices ranging from clinical equipment, common biomedical imaging equipment, cell & tissue engineering, regenerative tissue growth, pharmaceutical drugs, and therapeutics.

3.2 Vision and Mission of the Program

Vision:

To become a locally reputed and globally recognized Biomedical Engineering Department through nurturing excellence in teaching, research, and industrial partnership towards advanced cutting-edge healthcare technologies.

Mission:

a. To provide quality education in the emerging and extremely interdisciplinary field of Biomedical Engineering, utilizing up-to-date teaching and learning facilities contributing to advanced healthcare technologies.

b. To formulate and implement a modern academic curriculum to develop professionally sound and ethically strong Biomedical Engineers to provide dedicated services in the healthcare sector of the nation.

c. To facilitate innovative and industry-linked research platforms to foster the development of cutting-edge technologies and their proficient applications.

d. To improve the quality of common peoples' life in Bangladesh using knowledge and skills of modern science and technology.

3.3 Program Educational Objective (PEOs)

No	PEO Statement
PEO-1	Provide graduates mathematical, scientific, and engineering fundamentals and advanced knowledge of understanding in the sector of Biomedical Engineering including analysis techniques, design, developments, and implementation methodologies
PEO-2	Integrate technical and communicative knowledge with professional and industry-based education to build up successful professional careers in industry, government, and academia
PEO-3	Expose graduate's problem-solving skills and research-based education for life-long learning to adapt the innovation and changes.
PEO-4	Make the graduates capable of working in the broader area of technology, having the capability and responsibility of leadership and teamwork.
PEO-5	Enable the graduates to establish and run sustainable business enterprises along diverse career paths by creating, selecting, applying appropriate and modern technologies and tools.
PEO-6	Contribute the educational, cultural, social, technological and economic development of society through the ethical application of their knowledge and skills.

3.4 Program Outcomes

Based on the suggestion of the Board of Accreditation for Engineering and Technical Education (BAETE), Bangladesh, the Bachelor in Biomedical Engineering (BME) program will have the following learning outcomes:

1. **Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

2. **Problem analysis:** Identify, formulate, research the literature and analyze complex engineering problems and reach substantiated conclusions using the first principles of mathematics, the natural sciences, and the engineering sciences.

3. **Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for public health and safety as well as cultural, societal, and environmental concerns.

4. **Investigation:** Conduct investigations of complex problems, considering the design of experiments, analysis, and interpretation of data, and synthesis of the information to provide valid conclusions.

5. **Modern tool usage:** Create, select, and apply appropriate techniques, resources and modern engineering and IT tools, including prediction and modeling, to complex engineering activities with an understanding of the limitations.

6. **The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues, and the consequent responsibilities relevant to professional engineering practice.

7. **Environment and sustainability**: Understand the impact of professional engineering solutions in societal and environmental contexts and demonstrate sustainable development knowledge.

8. **Ethics:** Apply ethical principles and commit to professional ethics, responsibilities, and the norms of the engineering practice.

9. **Individual work and teamwork:** Function effectively as an individual and as a member or leader of diverse teams as well as in multidisciplinary settings.

10. **Communication:** Communicate effectively about complex engineering activities with the engineering community and with society at large. Be able to comprehend and write effective reports, design documentation, make effective presentations, and give and receive clear instructions.

11. **Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work as a member or a leader of a team to manage projects in multi-disciplinary environments.

12. **Life-long learning:** Recognize the need for and have the preparation and ability to engage in independent, life-long learning in the broadest context of technological change.

In addition to incorporating the above-listed POs, MIST also included the following Knowledge Profile (K1-K8) as an educational institution: may include additional outcomes in its learning programs. The ranges of Complex Problem Solving (P1 – P7) and Complex Engineering Activities (A1 – A5) that should be addressed in the program are summarized in the tables below.

Knowledge Profile (KP)

	Attribute
K1	A systematic, theory-based understanding of the natural sciences applicable to the discipline
K2	Conceptually based mathematics, numerical analysis, statistics and the formal aspects of computer and information science to support analysis and modeling applicable to the discipline
K3	A systematic, theory-based formulation of engineering fundamentals required in the engineering discipline
K4	Engineering specialist knowledge that provides theoretical frameworks and bodies of knowledge for the accepted practice areas in the engineering discipline; much is at the forefront of the discipline
K5	Knowledge that supports engineering design in a practice area
K6	Knowledge of engineering practice (technology) in the practice areas in the engineering discipline
K7	Comprehension of the role of engineering in society and identified issues in engineering practice in the discipline: ethics and the engineer's professional responsibility to public safety; the impacts of engineering activity; economic, social, cultural, environmental and sustainability
K8	Engagement with selected knowledge in the research literature of the discipline

Range of Complex Engineering Problem Solving

Attribute	**Complex Engineering Problems** have characteristic P1 and some or all of P2 to P7:
Depth of knowledge required	P1: Cannot be resolved without in-depth engineering knowledge at the level of one or more of K3, K4, K5, K6 or K8 which allows a fundamentals-based, first principles analytical approach

Range of conflicting requirements	P2: Involve wide-ranging or conflicting technical, engineering and other issues
Depth of analysis required	P3: Have no obvious solution and require abstract thinking, originality in analysis to formulate suitable models
Familiarity of issues	P4: Involve infrequently encountered issues
Extent of applicable codes	P5: Are outside problems encompassed by standards and codes of practice for professional engineering
Extent of stakeholder involvement and conflicting requirements	P6: Involve diverse groups of stakeholders with widely varying needs
Interdependence	P7: Are high level problems including many component parts or sub-problems

Range of Complex Engineering Activities

Attribute	**Complex activities** means (engineering) activities or projects that have some or all of the following characteristics:
Range of resources	A1: Involve the use of diverse resources (and for this purpose resources include people, money, equipment, materials, information and technologies)
Level of interaction	A2: Require resolution of significant problems arising from interactions between wide-ranging or conflicting technical, engineering or other issues
Innovation	A3: Involve creative use of engineering principles and research based knowledge in novel ways
Consequences for society and the environment	A4: Have significant consequences in a range of contexts, characterized by difficulty of prediction and mitigation
Familiarity	A5: Can extend beyond previous experiences by applying principles-based approaches

3.5 Generic Skills

1. Apply the principles and theory of biomedical engineering knowledge to the requirements, design and development of different biomedical equipment and devices with appropriate understanding.

2. Define and use appropriate research methods and modern tools to conduct a specific project.

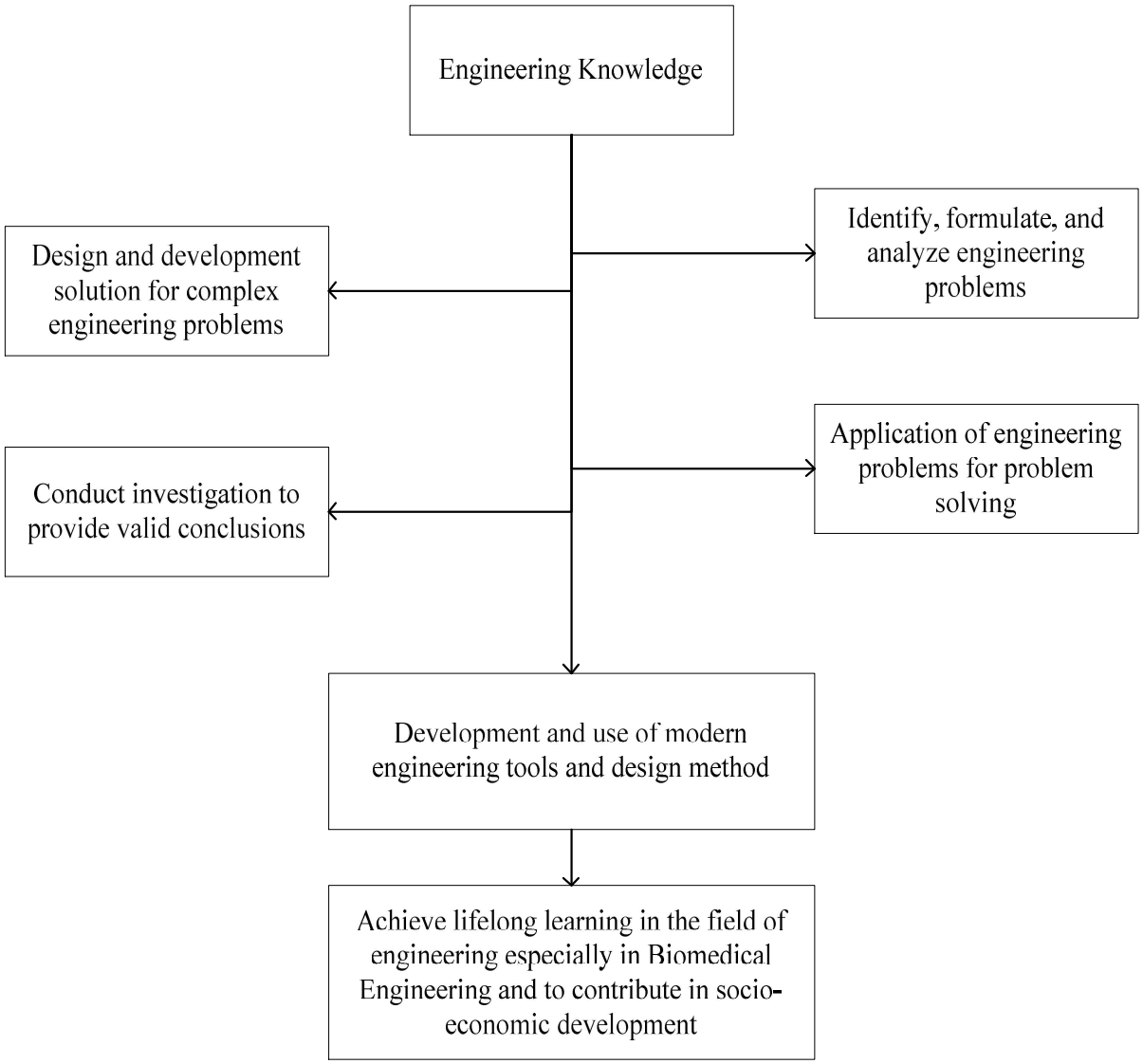
3. Learn independently, be self- aware, and self- manage their time and workload.

4. Apply critical thinking to solve complex engineering problems

5. Analyze real time problems and justify the appropriate use of technology

6. Work effectively with others and exhibit social responsibility

3.6 Curriculum/ Skill Mapping



CHAPTER 4

COURSE CURRICULUM FOR BACHELOR DEGREE IN BME

4.1 Course Schedule

Keeping the above mentioned program outcome, the course schedule for the undergraduate students of the Biomedical Engineering (BME) is given below:

Level/ Term	Basic Science		Math	General Education		Engineering Courses				Elective Course	Total
						Dept.		Non-Dept.			
	T	S	T	T	S	T	S	T	S	T	
L-1 (Spring)	6.00	1.50	3.00	2.00	-	2.00	-	3.00	1.50	-	19.00
L-1 (Fall)	6.00	1.50	3.00	2.00	1.50	3.00	1.50	-	-	-	18.50
L-2 (Spring)	-	-	3.00	2.00	1.50	3.00	-	6.00	3.00	-	18.50
L-2 (Fall)	-	-	3.00	-	-	9.00	4.50	3.00	-	-	19.50
L-3 (Spring)	-	-	-	-	-	12.00	4.50	3.00	1.50	-	21.00
L-3 (Fall)	-	-	-	-	2.00	12.00	7.50	-	-	-	21.50
L-4 (Spring)	-	-	-	4.00	-	6.00	6.00	-	-	6.00	22.00
L-4 (Fall)	-	-	-	2.00	-	9.00	3.00	-	-	6.00	20.00
% of Total Course	9.375		7.50	10.625		51.875		13.125		7.50	100.00
Total Credit Hr	15.00		12.00	17.00		83.00		21.00		12.00	160.00

T=Theory; S=Sessional

Table: Summary of Course Curriculum

4.2 Contact Hours and Credit Hours Distribution in Eight Terms

Level/Term	Theory Contact Hours	Sessional Contact Hours	Theory Credit Hours	Sessional Credit Hours	Total Contact Hours	Total Credit Hours
L-1 (Spring)	16.00	6.00	16.00	3.00	22.00	19.00
L-1 (Fall)	14.00	9.00	14.00	4.50	23.00	18.50
L-2 (Spring)	14.00	9.00	14.00	4.50	23.00	18.50
L-2 (Fall)	15.00	9.00	15.00	4.50	24.00	19.50
L-3 (Spring)	15.00	12.00	15.00	6.00	27.00	21.00
L-3 (Fall)	12.00	16.00+4 Weeks	12.00	9.50	28.00+4 Weeks	21.50
L-4 (Spring)	16.00	12.00	16.00	6.00	28.00	22.00
L-4 (Fall)	17.00	6.00	17.00	3.00	23.00	20.00
Total	119.00	79.00+4 Weeks	119.00	41.00	198.00+4 Weeks	160.00

4.3 Final Year

Final Year Design and Research Project

Final year design and research project will have to be undertaken by students under separate supervisors in partial fulfillment of the requirement of his/her degree. Credits allotted to the final year design and research project will be 6.00 corresponding to 12.00 contact hours. Topic and advisor selection of final year design and research project must be finalized within level-3, term-2.

4.4 BME Courses

The students have to complete all the core courses listed below:

4.4.1 List of Core Courses – BME

Ser	Course Code	Course Name	Credit Hour
1	BME 101	Introduction to Biomedical Engineering	2.0
2	BME 104	CAD in Biomedical Engineering Sessional	1.5
3	BME 105	Human Anatomy	3.0
4	BME 201	Human Physiology	3.0
5	BME 203	Biochemistry	3.0
6	BME 204	Biochemistry Sessional	1.5
7	BME 205	Biofluid Mechanics and Heat Transfer	3.0
8	BME 206	Biofluid Mechanics and Heat Transfer Sessional	1.5
9	BME 207	Biomedical Instrumentation and Measurements	3.0
10	BME 208	Biomedical Instrumentation and Measurements Sessional	1.5
11	BME 301	Statistics and Numerical Methods for Biomedical Engineers	3.0
12	BME 302	Statistics and Numerical Methods for Biomedical Engineers Sessional	1.5
13	BME 303	Biomechanics	3.0
14	BME 304	Biomechanics Sessional	1.5
15	BME 305	Biomedical Signal Processing	3.0
16	BME 306	Biomedical Signal Processing Sessional	1.5
17	BME 307	Medical Imaging	3.0
18	BME 309	Biomedical Transport Phenomenon	3.0
19	BME 311	Embedded Systems and Interfacing	1.5
20	BME 312	Embedded Systems and Interfacing Sessional	3.0
21	BME 313	Biomedical Image Processing	1.5
22	BME 314	Biomedical Image Processing Sessional	3.0

23	BME 315	Biomaterials	3.0
24	BME 316	Biomaterials Sessional	1.5
25	BME 318	Biomedical Engineering Design Sessional I	1.5
26	BME 300	Industrial Training	1.5
27	BME 401	Diagnostic and Therapeutic Equipment	3.0
28	BME 403	Molecular Biology for Engineers	3.0
29	BME 404	Molecular Biology for Engineers Sessional	1.5
30	BME 405	Healthcare Technology Management	3.0
31	BME 407	Rehabilitation Engineering	3.0
32	BME 409	Tissue Engineering	3.0
33	BME 412	Biomedical Engineering Design Sessional II	1.5
33	BME 400	Final Year Design and Research Project	6.0
Total			**83.0**

4.4.2 List of Courses – Basic Science and Mathematics

Ser	Course Code	Course Name	Credit Hour
1	PHY 125	Waves and Oscillations, Optics and Modern physics	3.0
2	PHY 127	Structure of matter, Electricity, Magnetism, and Mechanics	3.0
3	PHY 128	Physics Sessional	1.5
4	CHEM 103	General Chemistry	3.0
5	CHEM 104	Chemistry Sessional	1.5
6	CHEM 125	Physical and Bio-organic Chemistry	3.0
7	MATH 101	Differential and Integral Calculus	3.0
8	MATH 105	Vector Analysis, Matrix and Coordinate Geometry	3.0
9	MATH 205	Differential Equation, Laplace transform and Fourier Transform	3.0
10	MATH 231	Complex Variables and Linear Algebra	3.0
Total			**27.0**

4.4.3 List of Courses – General Education or Non-Skill and Language/ Communicative Language

Ser	Course Code	Course Name	Credit Hour
1	LANG 102	Communicative English I	1.5
2	GES 101	Fundamentals of Sociology	2.0
3	GEBS 101	Bangladesh Studies	2.0
4	GELM 271	Leadership and Management	2.0
5	LANG 202/LANG 204	Communicative English II/Bangla Language and Literature	1.5
6	GERM 352	Fundamentals of Research Methodology (Sessional)	2.0
7	GEPM 481	Project Management and Finance	2.0
8	GESL 421	Environment, Sustainability and Law	2.0
9	GEEM 451	Engineering Ethics and Moral Philosophy	2.0
Total			**17.0**

4.4.4 List of Core Courses – Interdisciplinary

Ser	Course Code	Course Name	Credit Hour
1	EECE 191	Principles of Electrical Engineering	3.0
2	EECE 192	Principles of Electrical Engineering Sessional	1.5
3	EECE 291	Electronic Circuits and Devices	3.0
4	EECE 292	Electronic Circuits and Devices Sessional	1.5
5	EECE 391	Digital Electronics	3.0
6	EECE 392	Digital Electronics Sessional	1.5
7	ME 291	Principles of Mechanical Engineering	3.0
8	CSE 291	Computer Programming	3.0
9	CSE 292	Computer Programming Sessional	1.5
Total			**21.0**

4.4.5 BME Elective Courses

At least TWO elective courses must be taken from each group.

4.4.5.1 Group-I (Instrumentation)

Ser	Course Code	Course Name	Credit Hour
1.	BME 411	Physiological Control System	3.0
2.	BME 413	Virtual Bioinstrumentation	3.0
3.	BME 415	Biophotonics	3.0
4.	BME 417	Equipment in Radiology and Radiotherapy	3.0

4.4.5.2 Group-II (Regenerative Medicine)

Ser	Course Code	Course Name	Credit Hour
1.	BME 419	Drug Development and Delivery System	3.0
2.	BME 421	Nanotechnology in Biomedicine	3.0
3.	BME 423	Artificial Organ Development	3.0
4.	BME 425	Bioinformatics	3.0

4.4.5.3 Group-III (Imaging)

Ser	Course Code	Course Name	Credit Hour
1.	BME 427	Advanced Biomedical Signal Processing	3.0
2.	BME 429	Nuclear Medicine	3.0
3.	BME 431	Biomedical Data Science	3.0

4.4.5.4 Group-IV (Biomechanics and Rehabilitation Engineering)

Ser	Course Code	Course Name	Credit Hour
1.	BME 433	Advanced Biofluid Mechanics	3.0
2.	BME 435	Biomedical Implants and Braces	3.0
3.	BME 437	Neuroscience and Neural Engineering	3.0
4.	BME 439	Biofabrication	3.0

4.5 Term-wise Distribution of Courses

4.5.1 LEVEL 1, SPRING

Ser	Course Code	Course Name	Contact Hour	Credit Hour
1.	BME 101	Introduction to Biomedical Engineering	2.0	2.0
2.	PHY 125	Waves and Oscillations, Optics and Modern physics	3.0	3.0
3.	GES 101	Fundamentals of Sociology	2.0	2.0
4.	CHEM 103	General Chemistry	3.0	3.0
5.	CHEM 104	Chemistry Sessional	3.0	1.5
6.	MATH 101	Differential and Integral Calculus	3.0	3.0
7.	EECE 191	Principles of Electrical Engineering	3.0	3.0
8.	EECE 192	Principles of Electrical Engineering Sessional	3.0	1.5
Total			**22.0**	**19.0**

4.5.2 LEVEL 1, FALL

Ser	Course Code	Course Name	Contact Hour	Credit Hour
1.	BME 104	CAD in Biomedical Engineering Sessional	3.0	1.5
2.	BME 105	Human Anatomy	3.0	3.0
3.	PHY 127	Structure of matter, Electricity and Magnetism, and Mechanics	3.0	3.0
4.	CHEM 125	Physical and Bio-organic Chemistry	3.0	3.0
5.	MATH 105	Vector Analysis, Matrix and Coordinate Geometry	3.0	3.0
6.	PHY 128	Physics Sessional	3.0	1.5
7.	GEBS 101	Bangladesh Studies	2.0	2.0
8.	LANG 102	Communicative English I	3.0	1.5
Total			**23.0**	**18.5**

4.5.3 LEVEL 2, SPRING

Ser	Course Code	Course Name	Contact Hour	Credit Hour
1.	BME 201	Human Physiology	3.0	3.0
2.	MATH 205	Differential Equation, Laplace transform and Fourier Transform	3.0	3.0
3.	EECE 291	Electronic Circuits and Devices	3.0	3.0
4.	EECE 292	Electronic Circuits and Devices Sessional	3.0	1.5
5.	CSE 291	Computer Programming	3.0	3.0
6.	CSE 292	Computer Programming Sessional	3.0	1.5
7.	GELM 271	Leadership and Management	2.0	2.0
8.	LANG 202/LANG 204	Communicative English II/Bangla Language and Literature	3.0	1.5
Total			**23.0**	**18.5**

4.5.4 LEVEL 2, FALL

Ser	Course Code	Course Name	Contact Hour	Credit Hour
1.	BME 203	Biochemistry	3.0	3.0
2.	BME 204	Biochemistry Sessional	3.0	1.5
3.	BME 205	Biofluid Mechanics and Heat Transfer	3.0	3.0
4.	BME 206	Biofluid Mechanics and Heat Transfer Sessional	3.0	1.5
5.	BME 207	Biomedical Instrumentation and Measurements	3.0	3.0
6.	BME 208	Biomedical Instrumentation and Measurements Sessional	3.0	1.5
7.	ME 291	Principles of Mechanical Engineering	3.0	3.0
8.	MATH 231	Complex Variables and Linear Algebra	3.0	3.0
Total			**24.0**	**19.5**

4.5.5 LEVEL 3, SPRING

Ser	Course Code	Course Name	Contact Hour	Credit Hour
1.	BME 301	Statistics and Numerical Methods for Biomedical Engineers	3.0	3.0
2.	BME 302	Statistics and Numerical Methods for Biomedical Engineers Sessional	3.0	1.5
3.	BME 303	Biomechanics	3.0	3.0
4.	BME 304	Biomechanics Sessional	3.0	1.5
5.	BME 305	Biomedical Signal Processing	3.0	3.0
6.	BME 306	Biomedical Signal Processing Sessional	3.0	1.5
7.	BME 307	Medical Imaging	3.0	3.0
8.	EECE 391	Digital Electronics	3.0	3.0
9.	EECE 392	Digital Electronics Sessional	3.0	1.5
Total			**27.0**	**21.0**

4.5.6 LEVEL 3, FALL

Ser	Course Code	Course Name	Contact Hour	Credit Hour
1.	BME 309	Biomedical Transport Phenomenon	3.0	3.0
2.	BME 311	Embedded Systems and Interfacing	3.0	3.0
3.	BME 312	Embedded Systems and Interfacing Sessional	3.0	1.5
4.	BME 313	Biomedical Image Processing	3.0	3.0
5.	BME 314	Biomedical Image Processing Sessional	3.0	1.5
6.	BME 315	Biomaterials	3.0	3.0
7.	BME 316	Biomaterials Sessional	3.0	1.5
8.	BME 318	Biomedical Engineering Design Sessional I	3.0	1.5
9.	GERM 352	Fundamentals of Research Methodology (Sessional)	4.0	2.0
10.	BME 300	Industrial Training	4 weeks	1.5
Total			**28.0**	**21.5**

4.5.7 LEVEL 4, SPRING

Ser	Course Code	Course Name	Contact Hour	Credit Hour
1.	BME 401	Diagnostic and Therapeutic Equipment	3.0	3.0
2.	BME 403	Molecular Biology for Engineers	3.0	3.0
3.	BME 404	Molecular Biology for Engineers Sessional	3.0	1.5
4.	BME 4**	Elective 1	3.0	3.0
5.	BME 4**	Elective 2	3.0	3.0
6.	GESL 421	Environment, Sustainability and Law	2.0	2.0
7.	GEPM 481	Project Management and Finance	2.0	2.0
8.	BME 412	Biomedical Engineering Design Sessional II	3.0	1.5
9.	BME 400	Final Year Design and Research Project	6.0	3.0
Total			**28.0**	**22.0**

4.5.8 LEVEL 4, FALL

Ser	Course Code	Course Name	Contact Hour	Credit Hour
1.	BME 405	Healthcare Technology Management	3.0	3.0
2.	BME 407	Rehabilitation Engineering	3.0	3.0
3.	BME 409	Tissue Engineering	3.0	3.0
4.	BME 4**	Elective 3	3.0	3.0
5.	BME 4**	Elective 4	3.0	3.0
7.	GEEM 451	Engineering Ethics and Moral Philosophy	2.0	2.0
8.	BME 400	Final Year Design and Research Project	6.0	3.0
Total			**23.0**	**20.0**

4.5.9 List of Elective Courses

At least TWO elective courses must be taken from each group.

Group-I (Instrumentation)

Ser	Course Code	Course Name	Credit Hour
1.	BME 411	Physiological Control System	3.0
2.	BME 413	Virtual Bioinstrumentation	3.0
3.	BME 415	Biophotonics	3.0
4.	BME 417	Equipment in Radiology and Radiotherapy	3.0

Group-II (Regenerative Medicine)

Ser	Course Code	Course Name	Credit Hour
1.	BME 419	Drug Development and Delivery System	3.0
2.	BME 421	Nanotechnology in Biomedicine	3.0
3.	BME 423	Artificial Organ Development	3.0
4.	BME 425	Bioinformatics	3.0

Group-III (Imaging)

Ser	Course Code	Course Name	Credit Hour
1.	BME 427	Advanced Biomedical Signal Processing	3.0
2.	BME 429	Nuclear Medicine	3.0
3.	BME 431	Biomedical Data Science	3.0

Group-IV (Biomechanics and Rehabilitation Engineering)

Ser	Course Code	Course Name	Credit Hour
1.	BME 433	Advanced Biofluid Mechanics	3.0
2.	BME 435	Biomedical Implants and Braces	3.0
3.	BME 437	Neuroscience and Neural Engineering	3.0
4.	BME 439	Biofabrication	3.0