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CHAPTER - 1
GENERAL INFORMATION

1.1 Introduction

With a view to meet the increasing demand for the development and dissemination of engineering and technological know-how, Bangladesh Armed Forces established the Bangladesh Army University of Science and Technology (BAUST), Saidpur that promises to provide facilities for higher technical education for the students from home and abroad. BAUST started its journey on 15 February 2015 by offering four-year bachelor's degrees on Computer Science and Engineering (CSE), Electrical and Electronic Engineering (EEE) and Mechanical Engineering (ME).

1.2 Aim

The aim of BAUST is to conduct undergraduate courses in various disciplines of Engineering according to syllabi leading to Bachelor of Science in Engineering (B. Sc. Engineering) for the students from home and abroad.

1.3 Objectives

The objectives of BAUST are:

1.3.1 To offer the following course with a view to meeting the increasing demands in the country:

(i) Four-year bachelor's courses in Computer Science and Engineering (CSE)
(ii) Four-year bachelor's courses in Electrical and Electronic Engineering (EEE) and
(iii) Four-year bachelor's courses in Mechanical Engineering (ME).

1.3.2 To produce skilled, well disciplined, self-motivated and dedicated engineers and computer professionals.

1.3.3 To make provisions for research and development and dissemination of knowledge in appropriate fields of science and technology.

1.4 Location

BAUST is located at Saidpur Cantonment, Saidpur, Nilphamari, a hub of knowledge for Bangladesh Armed Forces. Saidpur Cantonment is a calm and quiet education village and free from all possible pollution of a city life. Whistling birds on the tree branches and overall bounty of nature adds to the already existing splendid academic atmosphere.

1.5 Eligibility of Students for Admission in BAUST

The students must fulfill the following requirements:

1.5.1 Applicants must have passed SSC and HSC (or equivalent) examination in Science group with minimum GPA of 3.5 in both but total of minimum 7.5.

1.5.2 Candidates who have passed HSC or equivalent exam in the year or one year before the notification for admission can apply. Candidates with more than one year break of study will not be eligible to apply.

1.5.3 For O Level/Junior Cambridge and A Level/Senior Cambridge background students, the applicants must have to qualify minimum 5 subjects in O Level/Junior Cambridge and 3 subjects including Mathematics, Physics and Chemistry in A Level/Senior Cambridge with minimum C grade in all subjects.

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 100 marks and the distribution of marks is given below:

Ser.	Subject	Marks
1	Mathematics	30%
2	Physics	30%
3	Chemistry	30%
4	English	10%
	Total:	**100%**

1.6.2 Final Selection

Minimum qualifying marks in the written admission test is 40%. Merit list of candidates for final selection and admission to university will be prepared on the basis of the following:

Written Admission Test	75%.
GPA of SSC/ Dakhil / "O"level/ equivalent examination	10%.
Total GPA of HSC/ Alim/ "A" level/ equivalent examination	15%.
Total	**100%**

The Students will be selected strictly as per merit list prepared which will be given in the university website. Individual choice for selection of departments will be given preference as far as possible. In case of tie, merit position will be determined on the basis of marks obtained in admission test in Mathematics, Physics, Chemistry and English respectively. Further dispute will be solved giving priority of result of HSC over SSC examination.

1.6.3 Medical Checkup

Candidates selected through above procedure will go for medical checkup in BAUST/CMH. If the medical authority considers any candidate unfit for study in university due to critical/contagious/mental diseases as shown in medical policy of university will be declared unsuitable for admission.

CHAPTER - 2
THE DEPARTMENT OF MECHANICAL ENGINEERING (ME)

2.1 Introduction

Department of Mechanical Engineering has been established with the purpose of offering a wide range of technical education. The students those who have desire to acquire their knowledge with some core technical education can think about mechanical engineering. This department introduces the students with basic thermodynamics, fluid mechanics, heat transfer, production process, refrigeration and air-conditioning, power plant engineering, measurement and quality control etc. with excellent laboratory facilities. This department has a plan to provide the new era of education like mechatronics, robotics etc. to make the students compatible with modern technology. Today's Mechanical engineers are encouraged to undertake research and development activities in the above areas so that they will be able to engage themselves with research based activities. Mechanical Engineers apply the principles of mechanics and energy to the design of machines and devices. They must be able to control mechanical systems and usually work with other professionals in designing these systems. Automobiles, engines, heating and air-conditioning system, gas and steam turbines, air and space vehicles, trains, ships, servomechanisms, transmission mechanisms, machine tools, material handling systems, elevators and escalators, and robots used in industry are a few of the systems and devices requiring mechanical engineering knowledge. The department of Mechanical Engineering offers dynamic educational programs and a faculty poised to deliver quality engineering education. We are in an enviable position of continuing growth and rejuvenation. The department continues to search for young, promising researchers to enrich its academic staff and promote its exciting research vision. Part of that process entails expanding vertically by improving the foundation of its unique laboratory facilities, designing its educational programs for tomorrow's challenges, contributing to national endeavors.

2.2 Laboratory Facilities of the Department

The department endeavors to provide its faculty members and students adequate laboratory, library and other facilities, departmental undergraduate courses are laboratory intensive and these requirements are catered for by following laboratories:

(1) Thermodynamics Lab.
(2) Fluid Mechanics Lab.
(3) Strength of Materials Lab.
(4) Applied Thermodynamics (Heat Engine) Lab.
(5) Refrigeration & Air Conditioning Lab.
(6) Metallurgy Lab.
(7) Instrumentation, Measurement & Quality Control Lab
(8) Foundry and Welding Shop
(9) Machine Shop
(10) Drawing Lab

Students in Level-1 and Level-2 have to undertake laboratory courses (sessional) in Physics, Chemistry, Electrical and Electronic Engineering and Computer Science and Engineering too. If necessary undergraduate students can have the access to the facilities of other departments and centers during their project, thesis and research works.

CHAPTER - 3
EXAMINATION POLICY FOR UNDERGRADUATE PROGRAMS

3.1 Academic Calendar

3.1.1 From Level 1 to Level 4 there shall be two regular Terms (Term-I and Term-II), each ordinarily having duration of not less than 14 weeks of classes.

3.1.2 In each Term there shall be 4/5/6 theory courses. Besides theory courses there shall be some sessional courses in each term for engineering programs and there may be some sessional courses in some terms for other programs.

3.2 Duration of a Term

The duration of each term shall be as follows:

Events	Durations		
	Academic	Others	Total
Classes	7 weeks		
Mid Term Break		1 week	
Classes after Mid Term Break	7 weeks		
Preparatory Leave for Term Final Examinations		2 weeks	
Term Final Examination	3 weeks		
Result Publication	2 weeks		
Improvement and Backlog Examination	2 weeks		
Total	**21 weeks**	**3 weeks**	**24 weeks**

3.3 Course Pattern and Credit Structure

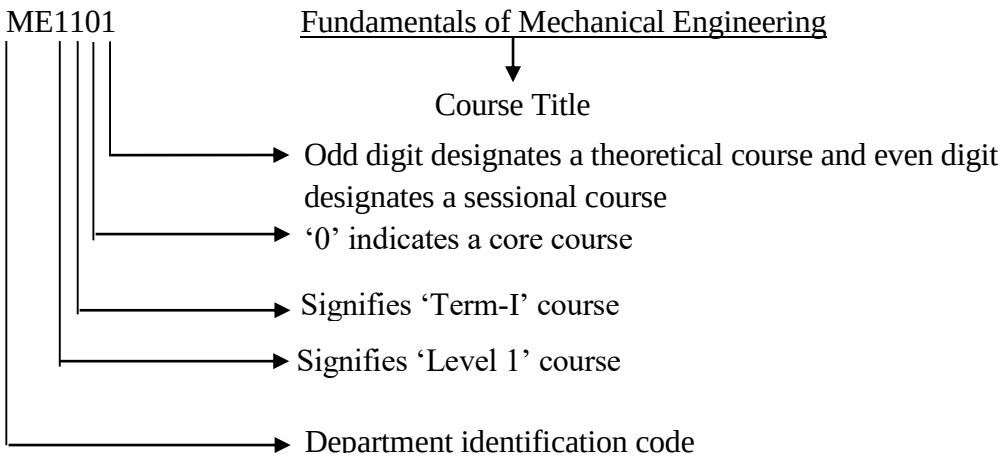
The undergraduate programs are covered by a set of theoretical courses. For engineering programs there is also a set of sessional courses to support the theoretical courses. For other program there may be some sessional courses in some terms.

3.3.1 Course Designation System

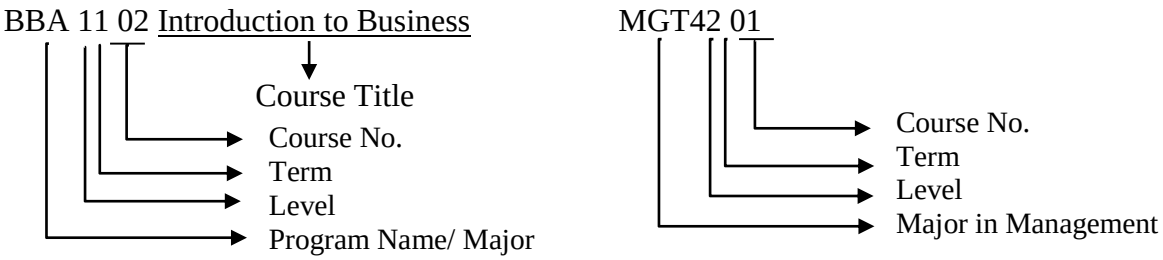
Each course is designated by a two to four letter code identifying the department offering the course followed by a four-digit number having the following interpretation:

- The first digit corresponds to the level in which the students normally take the course.
- The second digit corresponds to the term in which the students normally take the course.
- The third digit is reserved for departmental use. The fourth digit identifies a specific area/group of study within the department specified by individual departments.
- The last digit is an odd number for theoretical courses and an even number for sessional courses. This is only applicable for engineering programs.

3.3.1.1 The course designation system for Engineering program is illustrated as follows:



3.3.1.2 The course designation system for BBA/ English program is illustrated as follows:



3.3.2 Assignment of Credits

The assignment of credits to theoretical course is different from that of sessional course, which is stated as follows:

- For theoretical courses one lecture per week per term is equivalent to one credit.
- For laboratory courses two class hours per week per term is equivalent to one credit.
- Credits are also assigned to Project/Thesis work taken by the students. The total credit assigned to project/ thesis work is 6.00 (3.00 for Level-4 Term-I and 3.00 for Level-4 Term-II) for engineering programs.

3.3.3 Types of Courses

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

3.3.3.1 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 the entire designated core courses of his/her discipline.

3.3.3.2 Prerequisite Courses

Some of the core courses are identified as prerequisite courses for some other courses. A prerequisite course is one, which is required to be completed before some other course(s) can be taken.

3.3.3.3 Elective Courses

Apart from the core courses, the students can choose from a set of elective courses in level-4 term-I and level-4 term-II. Elective courses are divided into different groups respective to the individual department.

3.4 Performance Evaluation: The Grading System

3.4.1 The Letter Grade

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 class tests/quizzes, class evaluation, class participation and a term final examination. The assessment in sessional courses is made by evaluating performance of the student at work during the class, set up test, viva-voce, report writing and final quiz. Each course has a certain number of credits, which describes its corresponding weightages. A letter grade with a specified number of grade points is awarded in each course for which a student is registered. 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.

Total credits specified in syllabus of each department have to be acquired in order to qualify for the respective degree. Letter grades and corresponding grade points shall be awarded according to the provisions shown below:

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

* Subject (s) in which a student gets 'F' grade shall not be counted towards the credit hours requirements and for the calculation of Grade Point Average (GPA)

3.4.2 Incomplete (I) Grade

If a student fails to attend 40% of the classes of any registered course in a Term whatever be the reasons, the registration shall be cancelled for that course and the course will be treated as Incomplete (I) course.

3.4.3 Withdrawal from a Term

If a student is unable to complete the Term Final Examination due to illness, accident or any other valid reason, he/ she may apply in prescribed form to the Registrar through his/ her Head of the Department for total withdrawal from the Term within 7 (seven) working days after the end of the Term final examination. However, he/ she may choose not to withdraw any laboratory/ sessional/ design course if the grade obtained in such a course is 'D' or better and that he/ she has to indicate clearly in his/ her withdrawal application. In case of illness the withdrawal application must be supported by a medical certificate from CMH/Medical Officer of BAUST. The Academic Council shall take final decision about such an application.

3.5 Distribution of Marks

3.5.1 Theory

3.5.1.1 For Engineering Programs and BBA Program

Thirty percent (30%) of marks of a theoretical course shall be allotted for continuous assessment, i.e. class tests/ quizzes/ presentation, class evaluation and class participation. The rest of the marks shall be allotted to the three hour duration term final examination. Distribution of marks for a given course is as follows:

Class Participation/Observation	5%
Class Attendance	5%
Class Tests/ Quizzes/ Presentation	20%
Final Examination (3 hours duration)	70%
Total	**100%**

The number of class tests/ quizzes/ presentation of a course shall be n+1, where n is the number of credits of the course. Evaluation of performance in class tests/ quizzes/ presentation shall be on the basis of the best n class tests/ quizzes/ presentation. The scheme of continuous assessment that a particular teacher wishes to follow for a course shall be announced on the first day of classes.

3.5.1.2 For English Department (BA Honors in English)

For English department Forty percent (40%) of marks of a theoretical course shall be allotted for continuous assessment, i.e. Mid-term Examination, class tests/ quizzes/ presentation, class evaluation and class participation. The rest of the marks shall be allotted to the three hour duration term final examination. Distribution of marks for a given course is as follows:

Class Participation/Observation	5%
Class Attendance	5%
Class Tests/ Quizzes/ Presentation	10%
Mid-Term Examination (1 hour duration)	20%
Final Examination (3 hours duration)	60%
Total	**100%**

The number of class tests/ quizzes/ presentation of a course shall be n, where n is the number of credits of the course. Evaluation of performance in class tests/ quizzes/ presentation shall be on the basis of all the n class tests/ quizzes/ presentation.

If a student remains absent in the final examination, he/ she shall obtain 'F' grade irrespective of the total marks obtained in the continuous assessment.

3.5.2 Sessional/ Practical Examinations

Sessional courses are designed and conducted by the concerned departments. Examination on sessional/practical subjects shall be conducted by the respective department before the end of the term. The date of practical examination shall be fixed by the respective department. Students shall be evaluated in the sessional courses on the basis of the followings:

3.5.2.1 Lab based Sessional

Class Attendance	10%
Class Performance	10%
Report/ Assignment	10%
Quiz	20%
Viva-Voce	20%
Lab Test/ Set up Test/ Final Exam/ Final Test	30%
Total	**100%**

3.5.2.2 Programming/ Project Based Sessional

Class Attendance	10%
Class Performance	10%
Report/ Assignment	10%
Quiz	20%
Viva-Voce/Presentation	20%
Online Test/ Project	30%
Total	**100%**

3.5.3 Basis for awarding marks for Class Attendance shall be as follows:

Attendance	Marks (%)
90 % and above	100%
85% to less than 90%	90%
80% to less than 85%	80%
75% to less than 80%	70%
70% to less than 75%	60%
65% to less than 70%	50%
60% to less than 65%	40%
55% to less than 60%	30%
50% to less than 55%	20%
45% to less than 50%	15%
40% to less than 45%	10%

3.6 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. One is required to attend at least 60% of all classes held in any course. Student having attendance from 40% up to 60% shall have to pay a certain fine to attend the final examination. Students having attendance less than 40% shall not be allowed to attend the final examination.

3.7 Calculation of GPA and CGPA

3.7.1 Grade Point Average (GPA)

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 $C_1, C_2, \dots, C_n$ and his grade points in these courses are $G_1, G_2, \dots, G_n$ respectively then

$$GPA = \frac{\sum_{i=1}^{n} C_i * G_i}{\sum_{i=1}^{n} C_i}$$

3.7.2 Cumulative Grade Point Average (CGPA)

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 $TC_1, TC_2, \dots, TC_n$ and his GPA in these terms are $GPA_1, GPA_2, \dots, GPA_n$ respectively then

$$CGPA = \frac{\sum_{i=1}^{n} TC_i * GPA_i}{\sum_{i=1}^{n} TC_i}$$

3.7.3 A Numerical Example

3.7.3.1 GPA Calculation

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

Course	Credits, C_i	Grade	Grade Points, G_i	$C_i * G_i$
EEE 1101	3.00	A-	3.50	10.50
EEE 1102	1.50	A+	4.00	6.00
PHY 1111	3.00	B-	2.75	8.25
PHY 1112	1.50	C+	2.50	3.75
CHEM 1101	3.00	D	2.00	6.00
CHEM 1102	1.50	A-	3.50	5.25
MATH 1111	3.00	A+	4.00	12.00
ME 1152	1.50	B	3.00	4.50
HUM 1135	3.00	A	3.75	11.25
Total	**21.00**			**67.50**

GPA = 67.50/21.00= 3.2

3.7.3.2 CGPA Calculation

Suppose a student has completed all levels & terms and obtained the following GPA:

Level	Term	Credit Hours Earned, TC_i	GPA Earned, GPA_i	$GPA_i * TC_i$
1	I	21.00	3.73	78.330
1	II	21.00	3.85	80.850
2	I	19.50	3.75	73.125
2	II	22.00	3.80	83.600
3	I	18.00	3.50	63.000
3	II	22.50	3.56	80.100
4	I	18.00	3.70	66.600
4	II	21.00	3.62	76.020
Total		**163.00**	**3.691**	**601.625**

CGPA = 601.625/163.00 = 3.69

3.8 Promotion to the next Term/ Level

3.8.1 In each term there shall be 4/5/6 theory courses. A student has to pass at least 2 of 4, 3 of 5 and 4 of 6 theory courses for promotion to next higher Term/ Level **with a maximum of 2 (two) fail theory courses**. The fail courses will be treated as Backlog course.

3.8.2 Besides theory courses there shall be some sessional courses in each term for engineering programs and there may be some sessional courses in some terms for other programs. For promotion to next higher Term/ Level a student has to pass in all the sessional courses of the term. A student failed in only one

sessional course shall get a chance to retake the sessional course. But the course has to be cleared within the immediate next Backlog examination.

3.8.3 Consequences of Failing in Sessional Courses

Any student failing in one sessional course, must retake the sessional course in any suitable time as decided by the concerned department before the schedule of the Backlog Exam and appear the sessional exam during the Backlog Exam schedule. The student has to register the sessional course by depositing a prescribed fee. If any student fails in two sessional courses in the final exam or in the sessional retake course in the Backlog exam in a term, he/she fails in the term and has to repeat the term.

3.9 Improvement and Backlog Examinations

From Level-1 Term-II and higher a student may have a maximum of 4 cumulative Backlog courses. Backlog course(s) are those course(s) which a student registered in a Term but after final examination he/she obtained 'F' grade in that course(s). A student may also appear in the Improvement examination for the passed theory courses with letter grade less than 'B' in the final examination. The maximum letter grade obtainable in improvement examination shall be 'B+' and if he/she cannot improve the former letter grade of the final examination shall prevail. The maximum letter grade obtainable in Backlog courses shall be 'B'. The improvement and backlog examinations shall be held once in a term. Improvement and backlog courses in each level-term shall be treated as self-study (i.e., retaining the already obtained marks of class tests and class attendance with class performance). The improvement and backlog examinations will be held at any convenient time as decided by the authority.

3.10 Special Backlog Examination

A Special Backlog Examination on only Backlog courses may be conducted for the students who have participated in their 4 year degree course (up to level-4 term-II) and have a shortage of maximum 12 (twelve) credits to obtain Bachelor degree. The special backlog examination shall be arranged in a convenient time after 30 (thirty) days of publication of the final results of the level-4 term-II examination. The evaluation system shall be same as backlog with self-study. The students willing to appear at the special backlog examination have to apply to the Head of the Department and with his permission must register within 7 (seven) working days of publication of Level-4 Term-II and Backlog examination results. A student who will fail in the special backlog examination shall have to register the fail course(s) in the next regular term.

3.11 Exemption from Taking Courses for Level Repeat Students

If a student fails to get him/herself promoted to the next higher level on poor academic performance, he/she may seek readmission in the level in which he/she failed**.** In such case he/she shall be exempted from attending the sessional courses and theory courses in which he/she had already passed. But if a student having less than 'B' grade in theory course(s), he/she may repeat the respective course(s). In that case his/ her previous obtained grade shall be cancelled and the student has to apply to his/her respective department and the department shall forward that to the Office of the Controller of Exam. Information in respect of such exemptions for all students of each department is to be forwarded to the Office of the Controller of Examination before commencement of term final examination for necessary documentations.

3.12 Level/Term Repeat for Student under Punishment

No waiver shall be given to a student if a student repeats the Level/Term due to punishment; he/she must have to repeat all the courses of the repeating Level/Term.

3.13 Minimum Earned Credit and CGPA Requirement for obtaining Degree

Minimum credit hour requirements for the award of bachelor's degree in engineering (B.Sc. Engineering) and other disciplines shall be decided as per the existing rules. The minimum CGPA requirement for obtaining a Bachelor's degree in Engineering and other disciplines is 2.20. A student is expected to complete the whole course within 4 years (8 terms). For an unavoidable reason if a student fails to complete the course within the stipulated time of 4 years he/she must complete all degree requirements within a maximum period of 6 academic years (12 terms). Failure to complete all degree requirements within the given time frame may disqualify a student from continuation of his/her study at the university.

3.14 Course Registration Procedure

The time and date for course registration shall be announced in advance by the Registrar's office. Students will register his/ her courses in a Term according to following guidelines:

i) A student must pay all Hall dues before the course registration of a Term.
ii) The student must pay the Semester Fee of the semester.
iii) The student will complete the registration and Head of the Department will verify it.

Finally the Office of the Registrar will distribute course-wise list of registered students to the concerned department and Controller of Examinations.

3.15 Industrial/ Professional Training Requirements

Depending on each Department's requirement a student may have to complete a prescribed number of days of industrial/ professional training in addition to minimum credit and other requirements, to the satisfaction of the concerned Department.

3.16 Internship and Organizational Attachment for BBA Students

After the completion of 8 semesters (All levels and Terms with any major subject), a student will have to attach with any organization (Financial/Non-financial Institution, National or multinational companies) for three (03) months to acquire practical knowledge of real business. After obtaining the required knowledge, he/she has to submit an Internship Report on his/ her experience and also has to face a Viva-Voce. While preparing internship report, s/he will be supervised by a supervisor and a co-supervisor (if any) nominated by the concerned Department. Internship Program consists of a total of 06 credits as detailed below:

Internship and Organizational Attachment	03 Credit
Internship Viva-Voce	03 Credit
Total	06 Credit

3.16.1 Submission and Evaluation of Internship Report

The report must be submitted to the concerned supervisor within the stipulated time determined by the department. Final report, submitted by a student, shall be evaluated by the supervisor and the co-supervisor (if any). Total marks given by the evaluators shall be averaged for the final result.

3.16.2 Internship Viva-Voce

Viva-voce shall be conducted by a Board. This board shall be formed by the Departmental Head, consisting at least one expert from other university and all supervisors and co-supervisors or Departmental Teachers. The marks of Viva-Voce given by the individual board members shall be averaged to prepare the final result.

3.17 Rounding Off the Decimal Marks

If there is any decimal marks in any of the examinations like class test, tutorial, term paper, viva voce, course final examination then instead of rounding off the decimal figure in the result of every subject/sessional, it is to be rounded off only once during tabulation while converting the total marks to percentage mark after summation of all the subject/sessional marks. To round off, 0.5 and above is to be converted to next higher whole number and less than 0.5 is to be converted to previous whole number (For example 58.5% would be 59% and 58.49% would be 58%).

3.18 Rounding Off the GPA and CGPA

The GPA/CGPA is not to be rounded off like the total marks of each subject/sessional, but it is to be rounded off after two figure of decimal. To round of 3.555 and above after two figure of decimal, it is to be rounded off as 3.56 and 3.554 and below after two figure of decimal, it is to be rounded off as 3.55.

3.19 Honors, Dean's List and University Gold Medal

3.19.1 Honors/ Distinction

In Engineering programs candidates for Bachelor's degree shall be awarded the degree with Honors if their CGPA is 3.75 or better. For English they shall be awarded the degree with Distinction if their CGPA is 3.75 or better.

3.19.2 Dean's List

In recognition of excellent performance, the name of the students who maintain an average GPA of 3.75 or above in two regular Terms of an academic year may be published in the Dean's List in each Faculty and he/ she will be given a certificate from the respective Dean as recognition. Students who have obtained an 'F' grade in any course during any of the two consecutive regular Terms will not be considered for Dean's List in that year.

3.19.3 University Gold Medal

University Gold Medal for outstanding graduates shall be presented to the students who will secure the 1st position in each Department and whose CGPA is above or equal to 3.75. The student must have completed his/ her undergraduate course work within four consecutive academic years with no 'F' grades and have a satisfactory attendance to his credit.

CHAPTER - 4
COURSE REQUIREMENT FOR THE UNDERGRADUATE STUDY OF MECHANICAL ENGINEERING

4.1 Introduction

The lists of courses offered to the undergraduate students of Mechanical Engineering (ME) are categorized into Core courses and Optional courses. Some of the core courses are offered by the Department of ME and some by other departments. Students have the flexibility to choose from amongst the Optional courses.

4.2 Core Courses

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

4.2.1 List of Core Courses: MECHANICAL ENGINEERING

Course Code	Course Title	Level-Term	Contact Hours	Credit Hours
ME 1101	Fundamentals of Mechanical Engineering	1-I	3.0	3.00
ME 1108	Machine Shop Practice	1-I	3.0	1.50
ME 1110	Foundry and Welding Shop Practice	1-I	1.5	0.75
ME 1200	Mechanical Engineering Drawing-I	1-II	3.0	1.50
ME 2101	Thermodynamics	2-I	3.0	3.00
ME 2102	Thermodynamics Sessional	2-I	3.0	1.50
ME 2103	Engineering Mechanics	2-I	4.0	4.00
ME 2104	Engineering Mechanics Sessional	2-I	3.0	1.50
ME 2207	Engineering Metallurgy	2-II	3.0	3.00
ME 2208	Engineering Metallurgy Sessional	2-II	1.5	0.75
ME 2209	Mechanics of Solids	2-II	3.0	3.00
ME 2210	Mechanics of Solids Sessional	2-II	1.5	0.75
ME 2200	Mechanical Engineering Drawing-II	2-II	3.0	1.50
ME 3101	Heat Transfer –I	3-I	3.0	3.00
ME 3105	Fluid Mechanics-I	3-I	3.0	3.00
ME 3106	Fluid Mechanics-I Sessional	3-I	1.5	0.75
ME 3107	Measurement, Instrumentation and Quality Control	3-I	3.0	3.00
ME 3108	Measurement, Instrumentation and Quality Control Sessional	3-I	1.5	0.75
ME 3111	Numerical Analysis	3-I	3.0	3.00
ME 3112	Numerical Analysis Sessional	3-I	3.0	1.50
ME 3113	Machine Design-I	3-I	3.0	3.00
ME 3114	Machine Design Sessional-I	3-I	1.5	0.75
ME 3201	Heat Transfer-II	3-II	3.0	3.00
ME 3202	Heat Transfer Sessional	3-II	3.0	1.50
ME 3203	Mechanics of Machinery	3-II	4.0	4.00
ME 3204	Mechanics of Machinery Sessional	3-II	1.5	0.75
ME 3205	Fluid Mechanics-II	3-II	3.0	3.00

ME 3206	Fluid Mechanics-II Sessional	3-II	1.5	0.75
ME 3213	Machine Design-II	3-II	3.0	3.00
ME 3214	Machine Design-II Sessional	3-II	1.5	0.75
ME 4101	Internal Combustion Engines	4-I	3.0	3.00
ME 4102	Internal Combustion Engines Sessional	4-I	3.0	1.50
ME 4105	Fluid Machinery	4-I	3.0	3.00
ME 4106	Fluid Machinery Sessional	4-I	1.5	0.75
ME 4117	Refrigeration and Air Conditioning	4-I	3.0	3.00
ME 4100	Project and Thesis-I	4-I	6.0	3.00
ME 4217	Power Plant Engineering	4-II	3.0	3.00
ME 4218	Steam Laboratories Sessional	4-II	1.5	0.75
ME 4219	Automobile Engineering	4-II	3.0	3.00
ME 4233	Mechatronics	4-II	3.0	3.00
ME 4200	Project and Thesis-II	4-II	6.0	3.00
			Total Credit Hours =	**88.25**

4.2.2 List of Core Courses: Arts and Science

Course Code	Course Title	Level-Term	Contact Hours	Credit Hours
CHEM 1103	Chemistry-I	1-I	3.0	3.00
CHEM 1104	Chemistry Sessional	1-I	3.0	1.50
CHEM 1203	Engineering Chemistry	1-II	3.0	3.00
MATH 1101	Mathematics-I	1-I	4.0	4.00
MATH 1201	Mathematics-II	1-II	3.0	3.00
MATH 2101	Mathematics-III	2-I	3.0	3.00
MATH 2201	Mathematics -IV	2-II	4.0	4.00
HUM 1215	English	1-II	3.0	3.00
HUM 1216	Technical Report Writing & Presentation	1-II	3.0	1.50
HUM 2117	Economics	2-I	3.0	3.00
HUM 2219	Accounting & Industrial Law	2-II	3.0	3.00
PHY 1105	Physics-I	1-I	3.0	3.00
PHY 1205	Physics-II	1-II	3.0	3.00
PHY 1206	Physics Sessional	1-II	3.0	1.50
			Total Credit Hours =	**39.50**

4.2.3 List of Core Courses: CSE

Course Code	Course Title	Level-Term	Contact Hours	Credit Hours
CSE 1271	Computer Programming	1-II	3.0	3.00
CSE 1272	Computer Programming Sessional	1-II	3.0	1.50
			Total Credit Hours =	**4.50**

4.2.4 List of Core Courses: EEE

Course Code	Course Title	Level-Term	Contact Hours	Credit Hours
EEE 1159	Basic Electrical Engineering	1-I	3.0	3.00
EEE 1160	Basic Electrical Engineering Sessional	1-I	1.5	0.75
EEE 2159	Electrical Machines	2-I	3.0	3.00
EEE 2160	Electrical Machines Sessional	2-I	1.5	0.75
EEE 2259	Introduction to Analog and Digital Electronics	2-II	3.0	3.00
EEE 2260	Introduction to Analog and Digital Electronics Sessional	2-II	1.5	0.75
Total Credit Hours =				**11.25**

4.2.5 List of Core Courses: IPE

Course Code	Course Title	Level-Term	Contact Hours	Credit Hours
IPE 3277	Production Process	3-II	3.0	3.00
IPE 3278	Production Process Sessional	3-II	1.5	0.75
IPE 4115	Industrial Management	4-I	4.0	4.00
IPE 4207	Tool Engineering & Machine Tools	4-II	3.0	3.00
IPE 4208	Tool Engineering & Machine Tools Sessional	4-II	1.5	0.75
Total Credit Hours =				**11.50**

4.3 Optional Courses

From Level-4 Term-I, ME Department starts offering Optional courses. There are total two optional courses, one in Level-4 Term-I and another in Level-4 Term-II. In each term students have to choose one optional course from the various optional courses to be offered.

4.3.1 Optional-I Courses (For Level-4 Term-I)

Course Code	Course Title	Level-Term	Contact Hours	Credit Hours
ME 4121	Renewable Energy Technology	4-I	3.0	3.00
ME 4123	Energy Resources and Utilization	4-I	3.0	3.00
ME 4125	Materials Handling	4-I	3.0	3.00
ME 4127	Plastic Process Technology	4-I	3.0	3.00
ME 4129	Modern Manufacturing Technology	4-I	3.0	3.00
ME 4131	Petroleum Engineering	4-I	3.0	3.00
ME 4133	Composite Materials	4-I	3.0	3.00

4.3.2 Optional-II Courses (For Level-4 Term-II)

Course Code	Course Title	Level-Term	Contact Hours	Credit Hours
ME 4235	Operations Research	4-II	3.0	3.00
ME 4237	Aerodynamics	4-II	3.0	3.00
ME 4239	Metal Cutting Processes	4-II	3.0	3.00
ME 4241	Robotics	4-II	3.0	3.00
ME 4243	CAD & CAM	4-II	3.0	3.00
ME 4245	Servomechanism and Control Engineering	4-II	3.0	3.00
ME 4247	Energy and Environment	4-II	3.0	3.00

4.4 Term Wise Distribution of Courses

4.4.1 Level-1 Term-I

Course Code	Course Title	Type of Course	Contact Hours	Credit Hours
ME 1101	Fundamentals of Mechanical Engineering	Theory	3.0	3.00
CHEM 1103	Chemistry-I	Theory	3.0	3.00
EEE 1159	Basic Electrical Engineering	Theory	3.0	3.00
MATH 1101	Mathematics-I	Theory	4.0	4.00
PHY 1105	Physics-I	Theory	3.0	3.00
		Sub Total =	**16.0**	**16.00**
ME 1108	Machine Shop Practice	Sessional	3.0	1.50
ME 1110	Foundry & Welding Shop Practice	Sessional	1.5	0.75
CHEM 1104	Chemistry Sessional	Sessional	3.0	1.50
EEE 1160	Basic Electrical Engineering Sessional	Sessional	1.5	0.75
		Sub Total =	**9.0**	**4.50**
		Total =	**25.0**	**20.50**

4.4.2 Level-1 Term-II

Course Code	Course Title	Type of Course	Contact Hours	Credit Hours
CHEM 1203	Engineering Chemistry	Theory	3.0	3.00
CSE 1271	Computer Programming	Theory	3.0	3.00
HUM 1215	English	Theory	3.0	3.00
MATH 1201	Mathematics-II	Theory	3.0	3.00
PHY 1205	Physics-II	Theory	3.0	3.00
		Sub Total =	**15.0**	**15.00**
ME 1200	Mechanical Engineering Drawing-I	Sessional	3.0	1.50
CSE 1272	Computer Programming Sessional	Sessional	3.0	1.50
HUM 1216	Technical Report Writing & Presentation	Sessional	3.0	1.50
PHY 1206	Physics Sessional	Sessional	3.0	1.50
		Sub Total =	**12.0**	**6.00**
		Total =	**27.0**	**21.00**

4.4.3 Level-2 Term-I

Course Code	Course Title	Type of Course	Contact Hours	Credit Hours
ME 2101	Thermodynamics	Theory	3.0	3.00
ME 2103	Engineering Mechanics	Theory	4.0	4.00
EEE 2159	Electrical Machines	Theory	3.0	3.00
HUM 2117	Economics	Theory	3.0	3.00
MATH 2101	Mathematics-III	Theory	3.0	3.00
		Sub Total =	**16.0**	**16.00**
ME 2102	Thermodynamics Sessional	Sessional	3.0	1.50
ME 2104	Engineering Mechanics Sessional	Sessional	3.0	1.50
EEE 2160	Electrical Machines Sessional	Sessional	1.5	0.75
		Sub Total =	**7.5**	**3.75**
		Total =	**23.5**	**19.75**

4.4.4 Level-2 Term-II

Course Code	Course Title	Type of Course	Contact Hours	Credit Hours
ME 2207	Engineering Metallurgy	Theory	3.0	3.00
ME 2209	Mechanics of Solids	Theory	3.0	3.00
EEE 2259	Introduction to Analog and Digital Electronics	Theory	3.0	3.00
HUM 2219	Accounting & Industrial Law	Theory	3.0	3.00
MATH 2201	Mathematics -IV	Theory	4.0	4.00
		Sub Total =	**16.0**	**16.00**
ME 2208	Engineering Metallurgy Sessional	Sessional	1.5	0.75
ME 2210	Mechanics of solids Sessional	Sessional	1.5	0.75
ME 2200	Mechanical Engineering Drawing -II	Sessional	3.0	1.50
EEE 2260	Introduction to Analog and Digital Electronics Sessional	Sessional	1.5	0.75
		Sub Total =	**7.5**	**3.75**
		Total =	**23.5**	**19.75**

4.4.5 Level-3 Term-I

Course Code	Course Title	Type of Course	Contact Hours	Credit Hours
ME 3101	Heat Transfer –I	Theory	3.0	3.00
ME 3105	Fluid Mechanics –I	Theory	3.0	3.00
ME 3107	Measurement Instrumentation and Quality Control	Theory	3.0	3.00
ME 3111	Numerical Analysis	Theory	3.0	3.00
ME 3113	Machine Design –I	Theory	3.0	3.00
		Sub Total=	**15.0**	**15.00**
ME 3106	Fluid Mechanics -I Sessional	Sessional	1.5	0.75
ME 3108	Measurement Instrumentation and Quality Control Sessional	Sessional	1.5	0.75
ME 3112	Numerical Analysis Sessional	Sessional	3.0	1.50
ME 3114	Machine Design-I Sessional	Sessional	1.5	0.75
		Sub Total =	**7.5**	**3.75**
		Total =	**22.5**	**18.75**

4.4.6 Level-3 Term-II

Course Code	Course Title	Type of Course	Contact Hours	Credit Hours
ME 3201	Heat Transfer –II	Theory	3.0	3.00
ME 3203	Mechanics of Machinery	Theory	4.0	4.00
ME 3205	Fluid Mechanics –II	Theory	3.0	3.00
ME 3213	Machine Design – II	Theory	3.0	3.00
IPE 3277	Production Process	Theory	3.0	3.00
		Sub Total =	**16.0**	**16.00**
ME 3202	Heat Transfer Sessional	Sessional	3.0	1.50
ME 3204	Mechanics of Machinery Sessional	Sessional	1.5	0.75
ME 3206	Fluid Mechanics- II Sessional	Sessional	1.5	0.75
ME 3214	Machine Design -II Sessional	Sessional	1.5	0.75
IPE 3278	Production Process Sessional	Sessional	1.5	0.75
ME 3270 **	Industrial Training	Training	4 weeks	1.00
		Sub Total =	**9+4 weeks**	**5.50**
		Total =	**25+04**	**21.50**

****** It will be conducted after the completion of Level- 3, at any convenient time as can be arranged by the Department. Results will be recorded as Satisfactory or Unsatisfactory after the completion of training.

4.4.7 Level-4 Term-I

Course Code	Course Title	Type of Course	Contact Hours	Credit Hours
ME 4101	Internal Combustion Engines	Theory	3.0	3.00
ME 4105	Fluid Machinery	Theory	3.0	3.00
ME 4117	Refrigeration and Air Conditioning	Theory	3.0	3.00
IPE 4115	Industrial Management	Theory	4.0	4.00
ME ****	Optional- I	Theory	3.0	3.00
		Sub Total =	**16.0**	**16.00**
ME 4102	Internal Combustion Engines Sessional	Sessional	3.0	1.50
ME 4106	Fluid Machinery Sessional	Sessional	1.5	0.75
ME 4000	Project and Thesis-I	Sessional	6.0	3.00
		Sub Total =	**10.5**	**5.25**
		Total =	**26.5**	**21.25**

4.4.8 Level-4 Term-II

Course Code	Course Title	Type of Course	Contact Hours	Credit Hours
ME 4217	Power Plant Engineering	Theory	3.0	3.00
ME 4219	Automobile Engineering	Theory	3.0	3.00
ME 4233	Mechatronics	Theory	3.0	3.00
IPE 4207	Tool Engineering & Machine Tools	Theory	3.0	3.00
ME ****	Optional- II	Theory	3.0	3.00
		Sub Total =	**15.0**	**15.00**
ME 4218	Steam Laboratories Sessional	Sessional	1.5	0.75
IPE 4208	Tool Engineering & Machine Tools Sessional	Sessional	1.5	0.75
ME 4000	Project and Thesis-II	Sessional	6.0	3.00
		Sub Total =	**9.0**	**4.50**
		Total =	**24.0**	**19.50**
			Grand Total =	**162.00**

4.5 Summary of the Credit Hours Requirements

To obtain B. Sc. Engineering degree in Mechanical Engineering (ME), the following credits are to be earned:

Sl. No.	Courses	Credit Hour
1	ME Dept. Core Courses	88.25
2	ME Dept. Elective Courses	06.00
3	Courses to be offered by Arts and Science Dept.	35.00
4	Courses to be offered by English Dept.	04.50
5	Courses to be offered by EEE Dept.	11.25
6	Courses to be offered by CSE Dept.	04.50
7	Courses to be offered by IPE Dept.	11.50
8	ME Dept. Industrial Training	1.00
Total Credit Hours		**162.00**

CHAPTER – 5
DETAILED OUTLINE OF UNDERGRADUATE COURSES

5.1 Term Wise Description of Courses

5.1.1 Level-1 Term-I

ME 1101: Fundamentals of Mechanical Engineering

3.0 Contact Hour 3.00 Credit Hour

Energy: Sources, conventional and renewable energy, energy situation in Bangladesh, prospect of different energy sources in Bangladesh

Introduction to Steam Generation: Working principle of few common and modern boilers, difference between the fire tube and water tube boilers, description of boilers e.g. stationary fire tube boiler, Babcock and Willcox boiler, Stirling boiler, major boiler mountings and accessories, equivalent evaporation and boiler efficiency.

Internal Combustion Engines: Introduction of petrol and diesel engines, main parts, working principle of both 4 stroke and 2 stroke engines, ihp, bhp and mechanical efficiency calculations, air standard Otto cycle, Diesel cycle efficiency, p-v & T-s diagrams of cycles, brief description of carburetion, injection, ignition system, lubrication and cooling systems of IC engine.

Pumps, Blowers and Compressors: Introduction of pumps, blowers and compressors, classification and working principles.

Turbine: Working principle and application of different types of turbine.

Refrigeration and Air-conditioning Systems: Psychrometry, Fundamentals of refrigeration and air-conditioning system.

Robotics: Introduction, purpose, laws of robotics, degree of freedom, manipulator-actuator and other components.

CHEM 1103: Chemistry-I

3.0 Contact Hour 3.00 Credit Hour

Concepts of Atomic Structure: Different atom models, Quantum numbers, Electronic configuration, **Periodic Classification of Elements:** Periodic properties of elements, Properties and uses of noble gases.

Chemical Bonding: Types, properties, Lewis theory, VBT, MOT), Hybridization and shapes of molecules, Selective organic reactions such as- addition, substitution, oxidation- reduction, alkylation and polymerization.

Phase Rule: Phase diagram of mono component system.

Solutions and Their Classification: Unit expressing concentration, Colligative properties of dilute solutions, Thermo chemistry, Chemical kinetics, Chemical equilibrium, pH and buffer solutions, and Electrical properties of solution.

EEE 1159: Basic Electrical Engineering

3.0 Contact Hour 3.00 Credit Hour

Fundamental Concepts and Units, Electrical Networks: Network Laws and Theorems, methods of analysis. Electrical field concepts: Capacitance, Transient and steady state analysis of electrical networks for different forcing functions, Introduction to magnetic circuits.
Alternating Current: Effective and average values of alternating waveforms. Phasor and complex-impedance. Steady state analysis of AC networks. Balanced Poly-phase systems.
Introduction to Measurement of Electrical Quantities: Voltage, current and power.

MATH 1101: Mathematics-I

4.0 Contact Hour 4.00 Credit Hour

Differential Calculus: Limit, continuity and differentiability, successive differentiation of various types of functions, Leibnit'z theorem, Rolle's theorem, Mean Value theorem, expansion in finite and infinite forms, Lagrange's form of remainder, Cauchy's form of remainder (expansion of remainder), expansions of functions differentiation and integration, indeterminate form, Cartesian differentiation, Euler's theorem, tangent and normal, sub tangent and subnormal in cartesian and polar coordinates, maxima and minima of functions of single variables, curvature, asymptotes.
Integral Calculus: Definition of integrations, integration by the method of substitution, integration by parts, standard integrals, integration by the method of successive reduction, definite integrals and its use in summing series, Walli's formula, improper integrals, beta function and gamma function, multiple integral and its application, area, volume of solid revolution, area under a plain curve in Cartesian and polar coordinates, area of the region enclosed by two curves in Cartesian and polar coordinates, arc lengths of curves in Cartesian and polar coordinates.
Coordinate Geometry
Two Dimensions: Transformation of co-ordinates, equation of conics, its reduction to standard forms, pair of straight lines, homogeneous equations of second degree, angle between straight lines, pair of lines joining the origin to the point of intersection of two given curves, circles and system of circles, orthogonal circles, radical axis and its properties, radical centers, coaxial circles and limiting points, equations of parabola, ellipse in Cartesian and polar coordinates.
Three Dimensions: System of coordinates, projection, direction cosines, equations of planes and lines, angle between lines and planes, distance from a point to a plane, co-planner lines. Shortest distance between two given straight lines, standard equation of conicoides, sphere and ellipsoid.

PHY 1105: Physics-I

3.0 Contact Hour 3.00 Credit Hour

Structure of Matter: States of matter: solid, liquid, and gas. Classification of solids: amorphous, crystalline, ceramic and polymers; Plasticity and Elasticity, Atomic arrangement in solid; different types of bonds in solids: metallic and Vander Waal's, covalent and ionic bond. Packing in solids; Inter atomic distances and forces of equilibrium; X-ray diffraction; Bragg's law, distinction between metal, insulator and semiconductor.
Electricity and Magnetism: Electricity: electric charges and Coulomb's law. The electric field: calculation of the electric flux and Gauss' law; some application of Gauss' law, electric potential, relation between electric potential and electric-field; capacitors: Capacitance, dielectrics and atomic view, dielectric and Gauss' law; Current and resistances: current density, ohm's law, resistivity-an atomic view, Ampere's law, Faraday's law; Lenz's law, self-inductance and mutual inductance.
Magnetic properties of matter: magneto motive force, magnetic field intensity, permeability, susceptibility; classification of magnetic materials, magnetization curves.
Modern Physics: Photoelectric effect, Compton effect, de-Broglie wave, Bohr atomic model, radioactive decay, half-life, mean life, isotopes; nuclear binding energy, alpha, beta, gamma decay. **Theory of Relativity:** Michelson Morley's experiment, Galilean transformation, Special theory of relativity, Lorentz transformation, relative velocity, Length contraction, Time dilation, mass energy relation.

ME 1108: Machine Shop Practice

3.0 Contact Hour 1.50 Credit Hour

Shop safety practices, acquaintance with different marking, measuring and cutting hand tools and their functions used in fitting shop, practical jobs on the use of different hand tools, Acquaintance with different machine tools, operation and maintenance of different machine tools, practical jobs on: plain and taper turning, thread cutting, doing jobs by using lathe, shaper, milling, drilling and grinding machines.

ME 1110: Foundry and Welding Shop Practice

1.50 Contact Hour 0.75 Credit Hour

Foundry: Shop safety practice, acquaintance with foundry tools and equipment, introduction on foundry: molding, casting, pattern, core, bench, practice on simple bench or floor molding with solid and split pattern in green sand with and without cores, preparation of molding sand and core, preparation of mold, casting, study of defects in casting.
Welding: Shop safety practice, acquaintance with arc and gas welding tools, machines, electrodes, gas cylinders, and their identification, types of gas flames, safety and precaution,

job preparation for welding. Practice on gas, arc welding and gas cutting of MS sheets and plates, soldering and brazing practice, study of welding defects.

CHEM 1104: Chemistry Sessional

3.0 Contact Hour 1.50 Credit Hour

Laboratory experiments based on CHEM 1103.

EEE 1160: Basic Electrical Engineering Sessional

1.50 Contact Hour 0.75 Credit Hour

Laboratory experiments based on EEE 1159.

5.1.2 Level-1 Term-II

CHEM 1203: Engineering Chemistry

3.0 Contact Hour 3.00 Credit Hour

Fertilizer Industry: Sources of fertilizers, Natural Inorganic Natural Inorganic fertilizers, Natural organic fertilizers, Artificial fertilizer: Nitrogenous fertilizers, Phosphate fertilizers, Potassium fertilizers.
Paper Industry: Introduction, manufacture of pulp, Beating, refining, filling, sizing and coloring, Manufacture of paper, calendaring, uses.
Sugar Industry: Introduction, manufacture of cane sugar, sulphitation and carbonation. Crystallization, Separation of crystal, Drying, refining, Recovery of sugar from molasses.
Glass Industry: Raw materials, classification, manufacturing processes, properties and application of glasses in chemical industries.
Ceramic Industry: Fundamental of ceramic industry, raw materials, property, manufacture and classification of ceramic products.
Cement Industry: Raw materials, Manufacturing, Setting of cement, Properties of cement.
Refractory Materials: Raw materials, properties, manufacture and classification of refractory materials.
Plastics and Fibers: Fundamental characteristics, classification, raw materials, and manufacture of plastics, some typical examples of plastics and their uses. Types of fibers, raw materials, applications and manufacturing processes of synthetic fibers. Rubber: source of natural rubber, chemical treatment of latex, raw materials, synthetic reactions and properties of synthetic rubber.
Environmental Pollution From Industry: Industrial wastes and treatment process, Characterization of industrial wastes, types, treatment process, Characterization of industrial wastes, types, treatment and disposal of industrial wastes, Ecological problems of chemical

technology: The problem of sustenance and the chemical industry, Purification of industrial flue gases, purification of gases from aerosols, Effluents of industrial units and their purification, solid industrial wastes, removal of H_2S from gas stream.

Chemical Corrosion: Introduction to chemical corrosion, direct chemical corrosion, Electrochemical Corrosion, Factors affecting chemical corrosion, Galvanic corrosion, Atmospheric corrosion, Openair corrosion, Corrosion in contact to soil, Prevention of corrosion.

Surface Coating Materials: Introduction to paints, varnishes, metallic, non-metallic and organic protective coatings.

CSE 1271: Computer Programming

3.0 Contact Hour 3.00 Credit Hour

Introduction: Introduction to computer hardware and its working principle, Programming logic, algorithms and flowcharts.

C/C++: Introduction, fundamentals of C and C++ programming languages, how to write and execute programs, how to do debugging and testing, C and C++ fundamentals-data types and expressions, Operators, Libraries and keywords, Statements, Arrays and strings, Functions, Control statements, Pointers, Input and output systems, Objective oriented programming, Introduction to advanced programming.

HUM 1215: English

3.0 Contact Hour, 3.00 Credit Hour

Introduction: Importance and Mastering various approaches to learning English.

Phonetics: Phonetic systems, correct English pronunciation.

Grammatical Problems: Grammar and usages,

Approaches to Communication: Communication today, business communication.

Methods of Writing: Business letter, tenders and quotations, resumes and job letters.

Comprehension: Paragraph writing, précis writing, amplification.

Report Writing: Purpose of a report, classification of reports, organizing a report, writing short report, preparing complete analytical report, analysis and illustration of a report, problems in writing reports, journal articles, technical and scientific presentation

MATH 1201: Mathematics-II

3.0 Contact Hour 3.00 Credit Hour

Vector Analysis: Definition of vector, Equality of direction ratios and vectors, Addition and multiplication of vectors, Triple products and multiple products, Differentiation of vectors, Gradient of scalar functions, Divergence and curl of point functions, Physical significance of gradient, divergence and curl, integration of vectors (line, surface and volume integrals); Green's, Stoke's and Gauss's theorem and their application.

Matrices: Definition of matrix, algebra of matrices, multiplication of matrices, transpose of a matrix, inverse of matrix, rank and elementary transformation of matrices, solution of linear equations, linear dependence and independence of vectors, quadratic forms, matrix polynomials, determination of characteristic roots and vectors, null space and nullity of matrix, characteristic subspace of matrix.

PHY 1205: Physics-II

3.0 Contact Hour 3.00 Credit Hour

Geometrical Optics: Reflection and refraction by spherical surfaces, lenses, Combination of lenses, Equivalent lens and equivalent focal length. Defects of images formed by lenses, Monochromatic and chromatic aberrations, Spherical aberrations, Astigmatism, Coma, Distortion and curvature of image, achromatism and achromatic combination of lenses.
Oscillations: Differential equation of Simple harmonic motion, Combination of Simple harmonic motion, Lissajous figures, vibrating systems, Undamped and damped oscillations, determination of damping co-efficient, forced oscillation, resonance, two-body oscillations.
Waves: Transverse and longitudinal nature of waves, progressive and stationary waves, power and intensity of wave motion, Energy calculation of progressive and stationary waves, interference of sound waves, wave velocity, group velocity and phase velocity. Sound waves: audible, ultrasonic, infrasonic and supersonic waves, beat, Meld's experiment, Doppler's effect and its application.
Acoustics: Intensity of sound, Bel, acoustic intensity, architectural acoustics, noise insulation and reduction, sound distribution, Sabine's formula, room acoustics, requisites of a good auditorium.
Physical Optics: Theories of light, Huygen's principle and construction, superposition of light waves.
Interference: Introduction, condition of interference, Young's double slit experiment, Interference by multiple reflection, Newton's rings.
Diffraction: Introduction, Fresnel & Fraunhoffer diffraction, diffraction by single slit and double slit, Plane diffraction gratings.
Polarization: Introduction, Polarization by double refraction, Nicole Prism, Polarimeters, Production and analysis of polarized light, Optical activity, optics of crystals.

ME 1200: Mechanical Engineering Drawing-I

3.0 Contact Hour 1.50 Credit Hour

Fundamental Concepts: Introduction to pictorial drawing, drawing equipment and use of instruments, size description, scale, dimensioning rules.
Views and Projections: First angle, third angle projections, Orthographic projections, Isometric views, generation of views of solid bodies in different planes, sectional views, auxiliary views.

CSE 1272: Computer Programming Sessional

3.0 Contact Hour 1.50 Credit Hour
Sessional based on CSE 1271.

HUM 1216: Technical Report Writing & Presentation

3.0 Contact Hour 1.50 Credit Hour

Tutorial Discussion: On a given topic to test the proper use of phonetics, pronunciation grammar, logic and confidence.
Public Speaking: Demonstration by teacher for a short specific period, speaking by students (each student minimum twice) on different but easy given topic, well in advance as per a schedule maximum for 3 to 4 minutes for each student.
Extempore: Minimum two presentations by each student for a duration of maximum 3 to 4 minutes; Debriefing on public speaking and extempore presentation,
Presentation: On a given professional topic or on a given research paper using power point for 40 minutes followed by question and answer session. Group presentation or different given topics by the students using power point.

PHY 1206: Physics Sessional

3.0 Contact Hour 1.50 Credit Hour

Sessional based on PHY 1105 and PHY 1205

5.1.3 Level-2 Term-I

ME 2101: Thermodynamics

3.0 Contact Hour 3.00 Credit Hour

Introduction: Macroscopic and Microscopic points of view, Definition of Thermodynamic terms, Heat, work and their path dependence.
Ideal Gas: Definition and suitability as thermodynamic fluid, Equation of state, various thermodynamic processes, Specific heats, Internal energy, Enthalpy.
Laws of Thermodynamics: Statement and their corollaries, criterion of reversibility and irreversibility, Entropy, non-flow energy equation, internal energy, enthalpy, law of conservation of energy, perpetual motion machine of the first kind, Limitation of the first law of thermodynamics, heat engines and heat pumps, specific heats, relation between specific heats, application of the first law to some common closed system processes, the first law as applied to open system, steady flow energy equation, applications of the steady flow energy equation, non steady flow process, perpetual motion machine of the second kind,

thermodynamics temperature scale, inequality of Clausius, entropy, temperature-entropy diagrams for gases and vapors, entropy changes for a perfect gas undergoing various reversible processes, principle of increase of entropy.

General Thermodynamics Relations: Exact differential, Maxwell's relations, derivation of some useful general thermodynamic relations, Gibbs function and Helmohtzs, third law of thermodynamics.

Air Standard Cycles: Carnot cycle, Otto cycle, Diesel cycles, Dual cycle, Stirling cycles, Erricsion cycle, Joule cycle, Brayton cycles and their applications, representation of various cycles on a p-V and T-S planes, Cycle efficiency, Air compressor and blowers.

Vapor Power Cycles: Vapor power cycle, Carnot cycle, Rankine cycle, Reheat cycle and Regenerative cycle, Binary cycle, Introduction to combined cycle, Calculations of cycle efficiency.

Mixture of gases and Vapors: Mixture of ideal gases, gravimetric and volumetric analysis, Dalton's law of partial pressure, volume and entropy of gaseous mixtures, Isentropic process with gaseous mixtures ,specific humidity, relative humidity, dew point, dry and wet bulb temperatures, adiabatic saturation, Construction of psychometric chart and its uses

Fuels and Its Properties: Types of fuels, Formation of coal and petroleum fuel, grading of coal, Calorific value of fuels and its measurement, Freezing point, Flash point, Boiling point, Viscosity of liquid fuels, Modern development of solid, liquid and gaseous fuels, Nuclear fuels.

ME 2103: Engineering Mechanics

4.0 Contact Hour 4.00 Credit Hour

Introduction: Fundamental concept and principles of mechanics, Resultant of several concurrent forces, Resolution of forces into components.

Equilibrium of Particle: Free body diagram, Principle of transmissibility of forces and force couple system, Moment of a couple, equivalent couple, equivalent system of force couple systems, reduction of a system of forces.

Centroids and Center of Gravity: Centroids and CG of area and volume, Moment of inertia of area and mass, radius of gyration, parallel axes theorem, product of inertia, ellipsoid of inertia.

Analysis of Structure: trusses and frames.

Law of Friction: Equilibrium under frictional resistance, sliding friction, wedges and square threaded screw, Journal and thrust friction, rolling and belt frictions.

Kinematics of Particles: Rectilinear and curvilinear motion of particles, Determination of motion of a particle, motion of several particles, rectangular components of velocity and acceleration, Motion relative to frame in translation, tangential, normal, radial and transverse components.

Kinematics of Rigid Bodies: Translation, Rotation about a fixed axis, General plane motion, Absolute velocity and acceleration, Angular momentum, Relative velocity and acceleration, Coriolis acceleration.

Kinetics of Particles: Newton's second law of motion, linear and angular momentum, radial and transverse components of motion, motion under a central force, satellite motion, equation of orbit, conditions of orbiting and escape, cycle time, changing of orbit.
Kinetics of Rigid Bodies in Two and Three Dimension: Translation, Rotation about a fixed axis, absolute/Relative velocity and acceleration in plane motion, instantaneous center of rotation, angular momentum, application of the principle of impulse and momentum, motion of a rigid body in three dimensions.
Energy and Momentum Methods: Principle of work and energy and its application, Power and efficiency, Potential energy, Conservation of energy and its application to space mechanics, Direct and oblique central impact.
Plane Motion of Rigid Bodies: Equation of motions for a plane body, Angular momentum and its rate of change, constrained plane motion; principle of work and energy, eccentric impact, systems of rigid bodies.

EEE 2159: Electrical Machines

3.0 Contact Hour 3.00 Credit Hour

Induction Motors: Principles of operation, Torque-speed characteristics, improving starting torque for the cage and wind rotor motors, Speed control and braking of induction motors, single phase induction motors and their uses.
Synchronous Motors: Principles of operation, method of starting, power flow within motor, power develop by synchronous motor, equivalent circuit, excitation and effect, torque, industrial application.
Servo-Motors, Self-Starter and Alternators: Constructional details and working principle, Its applications for vehicle.
DC Machines: Constructional features and principle of operation, Shunt, series and compound generators and motors, Starting speed control of motors, Choice of DC motors for industrial applications.
Transformers: Constructional features and principles of operation, 3-Phase connection of transformers.

HUM 2117: Economics

3.00 Contact Hour 3.00 Credit Hour

Money management: Engineering economic decisions; Time value of money; Market and effective
interest rates; Equivalence calculation under inflation.
Evaluating business and engineering assets: Present worth, annual equivalence and rate-of-return analysis; Resolution of multiple rates of return.
Development of project cash flow: Accounting for depreciation and income taxes; Project cash flow
analysis; Handling project uncertainty. Replacement decisions; Benefit-cost analysis.

MATH 2101: Mathematics-III

3.0 Credit Hour 3.00 Contract Hour

Ordinary Differential Equations
Formulation of Differential Equations. Degree and order of Ordinary differential equations, Solution of first order but higher degree differential equations Solution of first order differential equations by various method Solution of general linear equations of second and higher orders with constant co-efficient. Solution of Homogeneous linear equations and its applications. Solution of differential equations by the methods based on the factorization of the operators, Frobenious methods, Bessel's functions, Legendre's polynomials and properties.
Partial Differential Equations
Introduction, Linear and nonlinear first order equations. Standard forms of linear equations of higher order, Equation of second order with variable coefficients. Wave equations, Particular solutions with boundary and initial conditions.

ME 2102: Thermodynamics Sessional

3.0 Contact Hour 1.50 Credit Hour

Sessional based on ME 2101.

ME 2104: Engineering Mechanics Sessional

3.0 Contact Hour 1.50 Credit Hour

Sessional based on the theory of ME 2103.

EEE 2160: Electrical Machines Sessional

1.50 Contact Hour 0.75 Credit Hour

Sessional based on EEE 2159.

5.1.4 Level- 2 Term- II

ME 2207: Engineering Metallurgy

3.0 Contact Hour 3.00 Credit Hour
Metals and Alloys: Industrially significant properties of metals, Malleability, Ductility, Hardness, Toughness, Fatigue resistance, Destructive and non-destructive tests applicable to metals.

Crystal Structure of Metals: Types of crystal lattice, Solidification of metals and alloys, Nucleation, Grain growth, Cooling curves, Variables affecting solidification, Equilibrium diagram for binary alloys, Interpretation of equilibrium diagram, Structure and properties of metals and alloys related to equilibrium, Iron-Iron carbide equilibrium diagram, plain carbon steel and their micro-structure, crystal defects, dislocation theory.
Heat Treatment: Methods and effects of hardening, Annealing, Normalizing, Quenching, Tempering, Austempering, Case hardening process, Precipitation process, Nitriding, Edge hardening, TTT diagram, S-curve.
Production, Properties and Uses: Ferrous materials, Pig iron, Wrought iron, Cast iron, Types of cast iron, Production of steels, Their types: Bessemer and open hearth processes, Alloy steels, Carbon steels.
Production Methods: Properties and uses of copper, Aluminum, Nickel, Tin and lead, Alloys of noble metals, Bearing materials, Spring materials.
Metallurgical Aspect of Metal Joining: Surface treatments, Plating, Metal coating, Metal spraying.
Powder Metallurgy: Introduction, powder metallurgy processes, preparation of metal powders, characteristics, mixing, compacting, sintering, application.
Composite Materials: Introduction to composite materials, importance of composite materials and uses, Latest developments in material science.

ME 2209: Mechanics of Solids

3.0 Contact Hour 3.00 Credit Hour

Simple Stress and Strain: Introduction, analysis of internal forces. Tension, compression, shear stress, axial stress in composites. Shearing, bending, centrifugal and thermal stresses, strain and deformation, stress-strain diagram, elasticity and elastic limits,
Modulus of Elasticity and Rigidity: Definition of some mechanical properties of materials, Poission's ratio, volumetric strain and bulk modulus. Relation between modulus of elasticity and bulk modulus, statically indeterminate members. Stresses in thin walled pressure vessels.
Statically Determinate Beams: Introduction, different types of loading and supports, shear force and bending moment diagram, various types of stresses in beams, flexure formula, economic sections, shearing stress in beam, general shear formula, deflection of beams, elastic curve, method of double integration, area moment and super-position methods, shearing stress and deflection in composite beams.
Statically Indeterminate Beams: Redundant supports in propped and restrained beams, solution by double integration. Area moment and superposition methods, design of restrained beams, continuous beams, three moment equation, determination of support reactions of continuous beam, shear and moment diagram.
Torsion: Torsion formula, angle of twist of solid and hollow shaft, torsional stiffness and equivalent shaft, classed coil helical spring.
Combined Stresses and Strains: Principal stresses and principal planes, combined axial and bending stresses, stress at a point, stress on inclined cutting planes, analytical method for the determination of stresses on oblique section, Mohr's circle, application of Mohr's circle to

combined loading. Transformation of strain components, strain rosette. Relation between modulus of rigidity and modulus of elasticity.
Column Theory: Introduction to elastic stability, Euler's formula for central load and different end conditions, modes of failure and critical load, slenderness ratio and classification of columns, empirical formula for columns, secant formula for columns with eccentric loading.

EEE 2259: Introduction to Analog and Digital Electronics

3.0 Contact Hour 3.00 Credit Hour

Introduction to Electronic Devices: Junctions, Semiconductor diodes, Rectifier diodes, schottky barrier diodes, Zener diodes, Tunnel diodes, Varactor diodes, LED, Photodiodes, Solar cells, Bipolar Junction Transistor, Field effect transistor, MOS, Unijunction transistor, SCR.
Introduction to Amplifiers: Biasing, Classification of amplifiers, BJT and FET amplifiers, Operational amplifiers, Differential amplifiers, Applications of amplifiers.
Application: Introduction to instruments, CRO, Transducers, Temperature measurement, Integrated Circuits (IC), VLSI technology.
Digital Electronics: Number system, Boolean algebra, logic gates and combinational circuits, half adder, full adder, decoder, multiplexer, flip-flops, counters and registers.

HUM 2219: Accounting & Industrial Law

3.0 Contact Hour 3.00 Credit Hour

Accounting
Fundamentals: Definition of accounting, accounting concept and convention, Definition of book keeping, objects and advantages of book keeping, Principles of double entry book keeping.
The Nature of Transaction: Classification of accounts, Rules for debit and credit, Kinds of cheques and treatment of cheques in accounts.
Journal: Journal posting, Balancing and closing,
Trial Balance: Introduction to trial balance, Functions, Preparation of trial balance, Limitations of trial balance, Financial statements, Analysis of financial statement.
Cost Accounting: Introduction, Reasons for cost accounts, Recorded cost, Estimated cost, Standard cost, Elements of cost, Cost statement, Sources of cost data, Distribution of overhead charges, Stores ledger, Marginal costing, Break-even point, Margin of safety, p/v ratio.
Budgeting: Types of budgets, Preparing budgets and budgetary controls.
Industrial Law
Industrial laws in Bangladesh: Various laws relating to wages, Working hours, Health, Safety and other condition of work, Legislation affecting employment in factories, Shops, Mines and agriculture, Law of social Insurance, Legislation for the control of industries.

Laws Governing Labor Relations: Collective bargaining, Trade union, Arbitration and conciliation, Labor contract, Lay off, Lock out, Strike and their legality, Labor court and tribunals.
ILO: The influence of I.L.O. on labor relations and welfare of labors.

MATH 2201: Mathematics-IV

4.0 Contact Hour 4.00 Credit Hour

Statistical Analysis: Regression and correlation analysis, curve fitting, Method of least square, Elementary probability theory, random variable, probability distribution function, moment generating function, Binomial distribution, negative Binomial distribution, geometric distribution, Poisson distribution, Normal distribution, Exponential distribution, Physical significance and practical examples of such distributions, law of large number and central limit theorem, estimation, hypothesis testing.
Fourier Analysis: Real and complex form. Finite transform: Fourier Integral, Fourier transforms and their uses in solving boundary value problems.
Complex Variables: Complex number system, General functions of a complex variable, Limits and continuity of a function of complex variable and related theorems, Complex function, differentiation and the Cruchy-Riemann Equations. Line integral of a complex function, Cauchy's Integral Formula, Liouville's Theorem, Taylor's and Laurent's Theorem, Singular Residues, Cauchy's Residue Theorem.
Laplace Transform: Definition. Laplace transforms of some elementary functions. Sufficient conditions for existence of Laplace transform. Inverse Laplace transforms. Laplace transforms of derivatives. The unit step function. Periodic function, Some special theorems on Laplace transform. Partial fraction, Solutions of differential equations by Laplace transform. Evaluation of improper integral.

ME 2208: Engineering Metallurgy Sessional
1.50 Contact Hour 0.75 Credit Hour
Sessional based on ME 2207.

ME 2210: Mechanics of Solids Sessional

1.50 Contact Hour 0.75 Credit Hour

Experiments based on ME 2209.

ME 2200: Mechanical Engineering Drawing-II

3.0 Contact Hour 1.50 Credit Hour

Application: Fasteners, gears, keys and springs; Sectional views and conventional practices; Auxiliary views; Specifications for manufacture;
Auto CAD: Introduction to CAD and its applications in working drawings; Surface development and intersections, Basic 3D drawing commands and drafting of 3D drawings on computer.

EEE 2260: Introduction to Analog and Digital Sessional

1.50 Contact Hour 0.75 Credit Hour

Sessional based on EEE 2259.

5.1.5 Level-3 Term-I

ME 3101: Heat Transfer-I

3.0 Contact Hour 3.00 Credit Hour

Fundamental Concept: Introduction to basic modes of heat transfer.
Conduction: Law of conduction, general heat conduction equation.
Steady-State One-Dimensional Heat Conduction: Plane wall, cylinder, sphere, composite structures. Straight fins of rectangular and triangular profiles. Consideration of variable thermal conductivity and systems with heat sources. Overall heat transfer coefficient, Critical thickness insulation, thermal contact resistance.
Steady State Two-Dimensional Conduction: Analytical and numerical solutions.
Unsteady State Conduction: Lumped heat capacity system, transient heat flow in a semi-infinite solid, transient heat flow with a convection boundary condition
Radiation: Electromagnetic spectrum, blackbody radiation, radiation properties, Kirchhoff's identity, concept of gray body, radiation shape factor, heat exchange between non black bodies, infinite parallel planes, concentric spheres and long cylinders, enclosure problems, radiation shields, solar radiation, gas radiation and its prospects in Bangladesh.

ME 3105: Fluid Mechanics-I

3.0 Contact Hour 3.00 Credit Hour

Introduction: Fundamental concepts, viscosity, compressibility and elasticity, surface tension and capillarity, vapour pressure, manometer.

Fluid Statics: Pressure at a point, pressure gradient, pressure on flat and curved surfaces immersed in fluids, center of pressure. Buoyancy and flotation, metacenter and metacentric height, stability of submerged and floating bodies, fluid containers subjected to constant acceleration and rotation;

Kinematics of Fluid Flow: Velocity and acceleration of fluid particles, types of fluid flow, systems and control volumes; one and two dimensional flow; continuity equation. Eulers' equation and Bernoulis' equation. Hydraulic grade line and energy grade line. Energy equation with or without losses, comparison of energy equation with Bernaullis equation, kinetic energy correction factor. Transient flow in emptying of tank and flow between connected vessels. Flow measuring devices. Flow through sharp edged orifice, the pitot tube, the venturi-meter, the flow nozzle and orifice meter, notches and sharp crested weirs.

Momentum equation for inertial control volume, application of momentum principle for incompressible fluids in variable area duct. Impact of jet on fixed and moving vanes. Application of momentum principle for jet propulsion and propellers. Momentum correction factor: Force caused by a flow round a pipe-bend, force at nozzle and reaction of a jet, force on solid body in a flowing fluid.

Dimensional Analysis: Fundamental & derived units, Dimensional homogeneity, Buckinghum theorem, significance of dimensionless numbers, Application of dimensional analysis in fluid flow problems.

ME 3107: Measurement, Instrumentation and Quality Control

3.0 Contact Hour 3.00 Credit Hour

Measurement

Basic Principles of Measurement: Measuring and recording methods, instrument calibration; measurement of displacement, pressure, temperature, heat-flux, flow, motion and vibration, force, torque, strain, etc.; data acquisition, analysis and processing, sources of error in measurements, error analysis.

Techniques: Techniques for maintaining standards, allowances and tolerance. Types of tolerance, grades of manufacturing accuracy, limits and fits, types of fits. Basic hole system and basic shaft system, selective assembly and interchangeable manufacturing, limit gauges, Taylor's principle of limit gauging.

Instrumentation

Sensors for measuring stress, Strain, Pressure, Temperature, Position, Velocity etc., Signal conditioning techniques using Wheatstone bridge, Operational amplifiers.

Quality Control: Objectives, quality and quality assurance, TQM; concepts and tools, statistical quality control (SQC), concepts of control charts, control charts for variables and attributes e.g. X, R, C , P etc. charts, drawing of control charts and selection of subgroups, acceptance sampling and sequential sampling.

Quality Assurance Programs: ISO, SA standards, requirements and certification procedure.

ME 3111: Numerical Analysis

3.0 Contact Hour 3.00 Credit Hour

Numerical Analysis: Solutions of linear equations: Iterative method, Newton-Raphson method, Gauss's method, Matrix method, Iteration method.
Interpolation: Finite differences, interpolation formula, Newton's formula for forward and backward interpolation. Lagranges interpolation formula, Striling's interpolation formula, Gauss's central difference formula, Bessel's interpolation formula.
Numerical Differentiation: Use of interpolation formula, graphical method.
Numerical Integration: General formula for equidistant ordinates, Trapezoidal rule, Simpson's rule, Gauss's formula. Use of Lagranges interpolation, graphical integration.
Solutions of Differential Equations By Numerical Methods: solution by Taylor's series, Picards method, Euler's method, Runga Kutta method.
Finite Element Method: Introduction of Finite element method in Engineering, Finite element modeling.

ME 3113: Machine Design-I

3.0 Contact Hour 3.00 Credit Hour

Introduction: Objectives of machine design, basic requirements for the design of machine elements and machines, approach to design, design methods and procedures, system design cycle.
Stress Analysis: Simple and combined stress; material and their properties, manufacturing considerations in design.
Theories of Failure: Failure of ductile materials and failure of brittle materials.
Variable loads and stress concentration, notch sensitivity, fatigue and fatigue failure.
Joints: Power screw, screwed joints, riveted joints, welded joints, gaskets and gasket joints.
Springs: Design of compression, extension and torsional springs in static and dynamic loading, leaf spring.
Columns: Design of column with central and eccentric loading.
Shaft Design: Design for fully reverse banding and steady torsion. Design for fluctuating banding and fluctuating torsion. Shaft deflection.
Key and Keyways: Types of keys, stresses in keys, key design, stress concentration in keyways.

ME 3106: Fluid Mechanics-I Sessional

1.50 Contact Hour 0.75 Credit Hour

Sessional based on ME 3105.

ME 3108: Measurement, Instrumentation and Quality Control Sessional

1.50 Contact Hour 0.75 Credit Hours

Experiments based on ME 3107.

ME 3112: Numerical Analysis Sessional

3.0 Contact Hour 1.50 Credit Hour

Using MATLAB to solve problems based on ME 3111.

ME 3114: Machine Design-I Sessional

1.50 Contact Hour 0.75 Credit Hour

Sessional based on ME 3113.

5.1.6 Level-3 Term-II

ME 3201: Heat Transfer-II

3.0 Contact Hour 3.00 Credit Hour

Convection: Different types of flow and convection, boundary layer concepts, dimensional analysis of forced and natural convection.
Forced Convection: Laminar flow over a flat plate; momentum, energy and integral equations, local and average heat transfer coefficients, forced convection turbulent flow over a flat plate, forced convection inside tubes and ducts, forced convection across cylinders and spheres, Flow across tube banks.
Natural Convection: Natural convection from horizontal and vertical plates and cylinders.
Heat Transfer With Change of Phase: Condensation, Drop-wise and film-wise condensation, their effect on heat transfer rate, Effect of film turbulence, Nuselt equations, Condensations number, Melting and solidification, Boiling, types of boiling, Process of bubble growth and bubble dynamics, Pool and film boiling, boiling curve, Boiling with vapour production, Critical heat flux, Forced convection boiling in horizontal and vertical tubes, Heat transfer rate in different phenomenon.
Heat Exchanger: Basic types of heat exchanger, Compact heat exchanger, LMTD, heat exchanger efficiency, fouling and scaling of exchanger surface, NTU method of heat exchanger design, applications of heat exchangers.
Mass Transfer: Introduction, Fick's law of diffusion, Binary diffusion, Mass transfer coefficient, Evaporation process and heat transfer, Convective mass transfer by analogy.

ME 3203: Mechanics of Machinery

4.0 Contact Hour 4.00 Credit Hour

Mechanics of Machinery: Simple mechanism, Inertia and kinetic energy of rotation and reciprocating parts, Turning moment diagram, Fluctuation of energy and speed, Fly wheel balancing of stationary, rotating and reciprocating masses, balancing of in-line engines, principle of direct and reverse cranks in balancing problems, Balancing machines, Belt, rope and chain drives, Law of gearing forms of tooth and types of gear, Gear trains and their arrangements, Analytical and tabular methods of simple, compound and epicyclic gear trains, compound epicyclic trains and their applications, Torque transfer by gear train, Types of governor and governing, working principles of different types of governor, controlling force curves, governor stability, sensitiveness, effort and power of governor, Cam and follower, various profiles of cams and their motions, Gyroscopic couple and processional motion.
Vibration: Free, forced and damped vibration of systems having one degree of freedom, Beat, Resonance and transient phenomena in forced vibration, Torsional Oscillation of shafts, Whirling of shafts, Transverse vibration of shafts, Simple pendulum treated by energy method, Simple situation of vibration with two degree of freedom having elastic constraints, Torsional oscillation of shafts with multi rotors, Self-excited vibration, Vibration measurement and measuring instruments, Elastic suspension of machinery for isolation of vibration, Vibration isolation and transmissibility; Isolator materials; Vehicle suspension, Vibration absorber.

ME 3205: Fluid Mechanics-II

3.0 Contact Hour 3.00 Credit Hour

Incompressible Viscous Flow: Viscous flow in pipes, laws of fluid friction. Froude's experiment, Darcy-Weisbech equation. Chezy, Manning and Hazen-williams' formulae; Laminar flow, shear and pressure gradient in laminar flow, Hagen-Poiseuille law. Laminar flow through inclined pipes, annulus and parallel plates. Shear stresses in turbulent flow. Eddy viscosity, expression for friction factor in turbulent flow. Energy correction factors for laminar and turbulent pipe flow. Moody chart and its use. Flows in pipe network. Pipe line system design.
Boundary Layer Theory: General concept, boundary layer thickness, characteristics of boundary layer, boundary layer on a flat plate with zero pressure gradient, friction drag due to boundary layers, effect of pressure gradient, transition for flat plate flow. Separation, wake behind a cylinder. Flow around submerged objects, aerofoil.
Open Channel Flow: Chezy equation, Gangulle-Kutter, Bazin and Manning’s Formulae, Optimum shape of flow cross section, Specific energy and critical depth, Froude number and its significance in channel flow, Hydraulic jump.
Ideal Fluid Flow: Rotational and irrotational motions, Circulation and vorticity, Velocity potential, Stream function, Relationship between stream function and velocity potential, Stream lines, Equipotential lines and flow-nets, Vortex motion, Free and forced vortex motion,

Doublet, Simple flows, Superposition of simple flows, Flow around a cylinder with and without circulation, Magnus effect and aerodynamic lift, Outline of Navier Stoke equation.

ME 3213: Machine Design-II

3.0 Contact Hour 3.00 Credit Hour

Design and Selection: Design and selection of sliding contact bearing, antifriction (ball and roller) bearing, Journal and plane surface bearing, Design of spur (loading and stresses), helical, bevel and worm gears, Design and selection of flexible power transmission elements, Belt (flat, v-belt, vv belt), chain (single and multi-strand) and rope drives, Design of brake and clutches.

IPE 3277: Production Process

3.0 Contact Hour 3.00 Credit Hour

Casting: Methods of sand casting, design of patterns, properties of molding sand, core and core making, casting in metallic and non-metallic moulds, die casting, centrifugal casting, precision investment casting, continuous casting. Defects of casting, causes and prevention.
Chip-less Metal Forming Process: Hot and cold working processes, rolling, properties of rolled products, cold drawing, forging, coining, stretching, bending, squeezing, extrusion, machines and tools for metal forming processes. Metal shearing operations, stamping, press and press tools.
Welding and Allied Processes: Gas welding: principle, equipments used, gas storage and safety measures. Gas cutting. Arc welding: principle, equipments used; AC and DC arc welding, electrodes, shielded arc welding: TIG, MIG and plasma arc welding; electrical resistance welding.
Special Welding Techniques: Thermit welding, LASER beam welding, brazing, soldering and braze welding, continuous welding. Welding job preparation, weldability, welded joint inspection, welding defects and causes of defects.
Metal Cutting Processes: Chip formation, types of chips, chip breakers, cutting forces, cutting fluid, tool geometry, cost and life of tool.
Machining Process: Lathe machine and accessories, types of lathes, drilling and other hole making machines, shapers and planners, milling, Gears and threads: manufacturing and related machines. **Finishing Operation:** grinding, honing, lapping, super-finishing etc.
Modern Manufacturing Processes: ECM, EDM, USM etc., processing of synthetic materials.

ME 3202: Heat Transfer Sessional

3.0 Contact Hour 1.50 Credit Hour

Sessional based on ME 3101 and ME 3201.

ME 3204: Mechanics of Machinery Sessional

1.50 Contact Hour 0.75 Credit Hour
Sessional based on ME 3203.

ME 3206: Fluid Mechanics-II Sessional

1.50 Contact Hour 0.75 Credit Hour

Sessional based on ME 3205.

ME 3214: Machine Design-II Sessional

1.50 Contact Hour 0.75 Credit Hour

Sessional based on ME 3213.

IPE 3278: Production Process Sessional

1.50 Contact Hour 0.75 Credit Hour
Sessional based on ME 3277.

5.1.7 Level-4 Term-I

ME 4101: Internal Combustion Engines

3.0 Contact Hour 3.00 Credit Hour

Introduction: Basic engine types, their operation and testing; Idealized cycles and processes; Fuels: IC engine fuels, their properties and tests; Combustion: SI engine, CI engine and gas turbines; Equilibrium charts; Exhaust gas analysis and air pollution; Fuel metering: SI engines, CI engines; Air capacity of engines: Two and four stroke cycles, naturally aspirated and supercharged engines, design considerations, application of principle of similitude engine design.
Compressors and turbines: Compression processes, volumetric efficiency, multistage compression, intercooling; various types of compressors and gas turbines.

ME 4105: Fluid Machinery

3.0 Contact Hour 3.00 Credit Hour

Fluid Machinery: Introduction to roto-dynamic and positive displacement machinery; Euler's pump turbine equation, Degrees of reaction, Impulse and reaction turbine classification,

Performance of Pelton wheel, Francis turbine and Kaplan turbine, Characteristic curves, Governing of turbines, Selections and model test of turbine, Cavitation of turbines, Torque converter and fluid couplings, Hydraulic crane.

Reciprocating Pumps: Working principle of reciprocating pump. Types of reciprocating pumps, Work done by reciprocating pump, Coefficient of discharge, Slip, Cavitation of reciprocating pumps, Effect of acceleration of piston on velocity and pressure in the suction and delivery pipes, Indicator diagrams, Effect of air vessels on suction and delivery line.

Centrifugal Pumps: Work done and efficiency of centrifugal pumps, Advantage over reciprocating pumps, Types of centrifugal pumps, Minimum starting speed, Least diameter of impeller, Limitation of suction lift, Characteristics curves, Priming, troubles and remedies, Specific speed and model testing, Pumps in series and in parallel, Deep tube well, Multistage pumps, Turbine pump, Selection of pumps, Introduction to Impeller design.

Compressor and Blower: Types and working principles, Axial Flow Pumps, Jet Pump, Single and Double Jet Pump, Fan, Blower.

Unsteady Flow: Introduction, Inertia pressure, Water hammer, Surge tanks.

Gas Dynamics: One dimensional compressible fluid flow, Energy relation for isentropic and isothermal flow, Pressure wave propagation, Mach cone, stagnation properties, Converging diverging nozzles, Subsonic and supersonic flow, Normal shock relations, Fanno line and Rayleigh line.

ME 4117: Refrigeration and Air Conditioning

3.0 Contact Hour 3.00 Credit Hour

Refrigeration

Introduction: Applications of refrigeration, Method of producing refrigeration, Steady-flow energy equation, Carnot cycle and reversed Carnot cycle, Coefficient of performance.

Vapor Compression Refrigeration Systems: Simple vapor compression refrigeration cycle, P-h and T-S diagrams, Actual cycle and its analysis, Volumetric efficiency of reciprocating compressors, Study of compressor, Condenser, Expansion device and evaporator used in a refrigeration system.

Refrigerants: Classification and designation of refrigerants, Primary and secondary refrigerants, Azeotropes, Desirable properties of refrigerants, Applications of specific refrigerants, Thermodynamic comparison of some common refrigerants.

Multi-pressure Refrigeration Systems: Applications, Removal of flash vapor, Inter-cooling, Analysis of few multi-pressure systems.

Absorption Refrigeration: Simple and practical absorption refrigeration systems, Coefficient of performance, Absorbent-refrigerant combinations, Comparison of vapor-compression and absorption refrigeration system, Electroloz and commercial system of refrigeration.

Air-Cycle Refrigeration: Applications, Closed and open air-cycles, Simple cycle and Bootstrap cycle for aircraft air conditioning.

Steam-Jet Refrigeration: Applications, Description and working principles of the system.

Low Temperature Refrigeration: Vapor compressor - Cascade system, Liquefaction of gas - Air and Helium.

Manufacturing Dry Ice: Carbon dioxide, Magnetic cooling, Heat pump: refrigerant circuit, performance of heat pump, Application of heat pump.
Solar absorption refrigeration, Vortex tube refrigeration, Thermoelectric refrigeration.

Air Conditioning

Psychrometrics: Properties of air and water-vapor mixture, Psychrometric chart and its construction, Various psychrometric processes, Psychrometers, Combined heat and mass transfer between a wetted surface and moist air.

Air Conditioning Load Calculations: Thermal comfort. Comfort chart, Inside and outside design conditions, Heat transmission coefficients for building structures, Heating and cooling load items and their calculations, Determination of dehumidified air quantity, Selection of cooling and dehumidifying coils, Selection and specifications of an air conditioning equipments, Basic types of air conditioning systems, Design of air conditioning system, Application of air-conditioning.

Conditioned Air Distribution Systems: Duct types, Materials and constructions, Duct layout and design, Fan selection.

Chilled/Hot Water Distribution Systems: Direct and reversed systems, Pipe layout and design, Pump selection.

Refrigeration and Air Conditioning Controls: Reasons for use of controls in refrigeration and air conditioning systems, Pneumatic, Hydraulic, Electric and electronic controls.

Food Processing and Preservation: Chilling, freezing, and free-drying, Candy manufacture, Bakery products, Fruits, Vegetables.

IPE 4115: Industrial Management

4.0 Contact Hour 4.00 Credit Hour

Management Fundamentals: Scope, function and role of management, Management and administration, Role of manager.

Development of Management Thoughts: Taylor's scientific management theory, Contribution of H. Fayol, E. Mayo, Gilbreths and other pioneers, Classical management theory, Principles of management.

Planning and Decision Making: Strategic management, planning process and organizational goal: MBO-nature and purpose, MBO process and effectiveness, Managerial decision making: the nature of decision making and decision making process, Portfolio analysis: SWOT, BCG, SPACE etc.

Organization: Fundamentals, organization variables, Organization structure, Types, Span of control, Authority, Responsibility and accountability, Centralization and decentralization, Organization culture, Reorganizing, Organization development.

Personnel and Human Resources Management: Functions, Personnel policies, Manpower planning, Recruitment and development, Leading and motivating: Types of leadership and styles, Theory of leadership, Morale and motivation, Motivation theories and morale building plans, Individual and group behavior, Job enlargement and enrichment, Performance appraisal/ merit rating, Job evaluation, Salary, Wages and wage incentive plans, Fringe benefits.

Marketing: Concepts of marketing mix, Product life cycle, Marketing decision making, Industrial and consumer selling, Channel of distributions, Sales promotion, Patent and trade mark, Marketing research, Development of new product.
Management Ethics: Social and ethical responsibility of managers.
Management Information System: MIS application of computer in management and decision making (DSS).
Global Management: Comparison of management systems of USA, Japan and China.
Financial Management: Financial analysis, ratio analysis, Different types of ratios and their uses, Limitations and trend analysis, Time value of money, Decision making based on PW, EUAW, B/C ratio, Break even analysis, Value engineering.
Safety Management and Emergency Planning: Preventive and break down maintenance, Occupational safety, fire and explosion hazards, Industrial safety, Electrical hazards.

ME 4102: Internal Combustion Engines Sessional

3.0 Contact Hour 1.50 Credit Hour

Sessional based on ME 4101.

ME 4106: Fluid Machinery Sessional

1.50 Contact Hour 0.75 Credit Hour

Sessional based on ME 4105.

ME 4000: Project and Thesis-I

6.0 Contact Hour 3.00 Credit Hour

Experimental and theoretical investigation of various problems related to Mechanical engineering. The topic should provide an opportunity to the student in developing initiative, creative ability and engineering judgment. Individual or group study (preferably not more than two in a group) will be required.
At the end of Term, the student is expected to complete the preliminary literature survey, select the topic for study- each student/group is expected to take part in the presentation of a least one seminar in the term, The seminar/seminars will be conducted on their respective Thesis/ Project topic, Complete theoretical study on the topic and submit a detailed report for evaluation.

5.1.8 Level-4 Term-II

ME 4217: Power Plant Engineering

3.0 Contact Hour 3.00 Credit Hour

Introduction: Sources of energy, Types of power plants and its modern trend, Survey of power plants in Bangladesh.
Variable Load Problems: Principle of optimization, its application to power system planning and design and technical operation.
Power Plant Economics: Theory of tariffs Instrumentation in power plants, Selection of plants, Advantages, Disadvantages and comparisons of different types of power plant.
Diesel Engine Power Plants: Scope, Arrangements, Air fuel system, Cooling system and lubrication system, Starting methods.
Steam Power Plants: Furnaces, Stokers and burners, Fuels, Fuel handling, Combustion equipment, Boilers, Steam turbines- reheat, regenerative, superposed, binary and combined cycles, Condensers, Evaporators and cooling towers, Gas loop and water loop, Steam piping and insulations, Installation and operation, Overall plant efficiency.
Hydro-electric Power Plants: Types of operation, Site selection, Turbine selection, Seasonal and intermittent plants, components of the plant, Efficiency, Governing of water turbines.
Gas Turbine Power Plants: Scope, Cycle analysis, Installation, Intercooling, Regeneration and reheating, governing and maintenance.
Nuclear Power Plant: types of reactors, layout of nuclear power plant, waste disposal.
Power Plant Accessories: Draft systems, Chimney design, Water-cooling systems, Water conditioning and industrial water treatment.
Electrical Power Transmission: Basic concepts, types of transmission and distribution systems, instrumentation in power plants.
Solar Energy: Availability of solar energy, solar devices, direct production of electricity, solar thermal energy conservation system.

ME 4219: Automobile Engineering

3.0 Contact Hour 3.00 Credit Hour

Introduction: General classification of motor vehicles, layout and main components, specification of an automobile. Performance of an automobile, calculation of total loads, tructive effort and propulsive power.
Chassis: Frame and body, suspension system, springs, wheels and tires.
Engine: Types, comparison, rating and specification, constructional details of automobile engine, engine mounting, engine cooling and lubricating systems, exhaust system, emission control.
Transmission: Clutch, gear box, propeller shaft, universal joint, final drive, differential, rear axle and front axle, over drive, under drive.

Automobile Control System: Steering system, brakes and braking system, speed control and governing. Automatic control system.
Automobile Electrical System: Battery and its maintenance, battery charging, generator and charging system, the cutout starting system, Bendix drive and Solenoid drive, self-starter, lighting and wiring system .
Ignition System: Components, ignition timing and ignition advance, magnetos, carburetion and fuel injection system, firing order.
Repair and Maintenance: Servicing, tuning, overhauling, inspection and testing, trouble shooting, safety measures.
Recent Advancement in Automobiles: EFI system, variable valve timing, automatic clutch and gear-change, pollution control.
C. N. G.: Production, processing, conversion of petrol and diesel engines to CNG vehicles.

ME 4233: Mechatronics

3.0 Contact Hour 3.00 Credit Hour

Mechatronics, Sensors and Transducers: Introduction to mechatronics systems, measurement systems and control systems, open and closed loop systems. Sensors and transducers: Introduction to sensors and transducers, sensor characteristics, classification of sensor. Sensors for displacement, position, proximity, velocity, motion, force. Torque and tactile sensors. Pressure, temperature, light sensors. Ultrasonic sensors; range sensors.
Actuation Systems: Linear and rotary actuators. AC and DC motors, stepper motor, servo motor. Fluid power actuators, smart actuators.
System Modeling and Control: Introduction to signals, systems and controls. System representation: Transfer function form, block diagram form. Linearization of nonlinear systems; time delays; measurement of system performances.
Modeling of mechanical, electrical, fluid and thermal systems. Rotational-transnational systems, electromechanically systems.
Control Systems Design: Introduction. Classical design: transfer functions, frequency response analysis, root lucas, bode plots, state-space design. Proportional-integral-derivative (PID) control, digital control, robust control, intelligent control.
Programming Logic Controllers: Introduction to PLC, basic structure, input/output processing; PLC programming, applications of PLC.

IPE 4207: Tool Engineering & Machine Tools

3.0 Contact Hour 3.00 Credit Hour

Tool Engineering
Work Holding Devices: Degrees of freedom, principles of location, Locating methods, Locators, Clamping devices and forces, Types, Design and detailed study of jigs and fixtures used in various machining processes.

Die Design: Dies and punches, Introduction to die cutting operations, Die clearance, Piercing and blanking die design, Cutting by punches, Strip layout, Bending, Forming and drawing dies, Drawing forces, Blank size determination.

Machine Tools

Fundamentals: Classification, Specification of different machine tools, Description of turret and copying lathe, Universal milling machine, Jig boring machine, Honing machine, Hobbing machine.

Kinematic Structure of Machine Tools: Developing the kinematic chain of machine tools, Determination of transmission ratio, Drawing of ray diagrams, Analysis of kinematic structure, Analysis of G.P. series.

Drive Systems: Mechanical, hydraulic, Electrical and pneumatic drive systems, Speed and feed gear boxes, Optimum speed, Gearbox design, Basic principles of cluster gear design, Step-less drives, Control systems in machine tools.

Modern Machining Techniques: Transfer line, Numerical control of machine tools-fundamental concepts, Main components of NC machine tools, Types of NC machines- machining center, Introduction of part programming, Introduction of CNC and DNC, Fundamentals of CAM, Application of group technology and introduction to flexible manufacturing system.

Robotics: Introduction to robotics, Basic components of robot technology levels, Manipulator features arm geometry, Rotation, Drive system, Work envelopes, Mounting, Internal components of controllers, General features, Input power, Master control memory.

Machine Installation and Testing: Installation procedure, Foundation design, Trends in the development of modern machine tools, Testing after installation.

ME 4218: Steam Laboratories Sessional

1.50 Contact Hour 0.75 Credit Hour

Sessional based on ME 4217.

IPE 4208: Tool Engineering & Machine Tools Sessional

1.50 Contact Hour 0.75 Credit Hour

Sessional based on ME 4207.

ME 4000: Project and Thesis-II

6.0 Contact Hour 3.00 Credit Hour

Experimental and theoretical investigation of various problems related to Mechanical engineering. The topic should provide an opportunity to the student in developing initiative, creative ability and engineering judgment. Individual or group study (preferably not more than two in a group) will be required.

A completed report/thesis will have to be submitted on the project/Thesis at the end of Term.

5.2 Description of Optional Courses

ME 4121: Renewable Energy Technology

3.0 Contact Hour 3.00 Credit Hour

Sources of Energy: Energy cycle, Non renewable energy sources, Coal, Oil, Natural gas, Nuclear fuel, Oil shale and tar sands, Renewable energy sources, Solar, Biomass, Wind hydropower, Geothermal, Waves, Ocean thermal and tidal.
Energy Conversion Techniques: Solar thermal conversion, Semiconductor devices, Bio-chemical and Thermo-chemical conversion of biomass, Wind energy conversion, Hydropower, Ocean thermal energy conversion.
Energy Extraction: Geothermal, Waves, Tides, Nuclear fission and fusion.
Energy Converting Devices and Storage: Thermoelectric, Thermo-ionic converters, Fuel cells, Magneto hydrodynamics, Storage of solar energy, Demand of energy storage in stationary and transport applications.
Economic and environmental aspects of energy sources.

ME 4123: Energy Resources & Utilization

3.0 Contact Hour 3.00 Credit Hour

Resources: The energy cycle of the earth, The energy scope, A study of available energy resources for the world and energy demand, Levels of extraction and technically feasible extraction.
Source and Conversion: Review of current conversion, Systems Bio-energy, Hydro-power, Wind power, Types of wind energy collectors, Storage system application, Geo-thermal energy: Sources, Disposal of used Geo-thermal fluids, Application, Geo-thermal power cycle, Tidal energy: Sources, Schemes for power generation, Ocean Thermal Energy Conversion (OTEC), Concepts of favorable location wave energy, Wave energy extractors, Solar energy: Introduction, Sun-Earth angles, Solar angle of incidence, Solar time, Solar radiation, Estimation and measuring instruments, Energy storage, Collectors, Solar pond design technique.
Application of Solar Energy: Heating, Cooling, Power generation, Pumping, Desalination, etc.
Utilization: Efficiencies of conversion system in current use, Matching of energy sources to application Hybrid & Stored energy system, Waste heat rejection and Utilization.
Environmental Impact: Aspects of air and thermal pollution and waste disposal problems arising from conversion systems.

ME 4125: Materials Handling

3.0 Contact Hour 3.00 Credit Hour

Importance and scope of material handling; Classification of materials - unit load and bulk loads; Analysis of material handling problems - system concept, selection and classification of conveying equipment; Efficiency of material handling systems; General theory of conveyors; Computer controlled material handling (AGV, ASRS etc); Description and design of belt, chain, flight, screw, pneumatic and hydraulic conveyors; Operation and selection of industrial truck loads. Packaging: packaging materials, layout for packaging; Testing procedure of packages - vibration test, drop test; Performance limit; Testing machines. Storage and warehousing, Sorting, Automated warehousing.

ME 4127: Plastics Process Technology

3.0 Contact Hour 3.00 Credit Hour

Introduction to polymeric materials, Mechanical and physical properties and limitations of applications, Testing of properties, Identification of common plastics, Fillers, Additives, Mixing & compounding, Mills: Internal and continuous, Polymer processing operations such as Extrusion, Compression continuous, Polymer molding, Injection molding, Blow molding and reaction injection molding, Design of products with plastics, Machining, Fitting and welding of plastics, Reinforcement of plastics, Calendaring and laminating, Instrumentation and control.

ME 4129: Modern Manufacturing Technology

3.0 Contact Hour 3.00 Credit Hour

Introduction to modern manufacturing technology. Modern manufacturing process: electro-discharge machining (EDM), electro-chemical machining (ECM), electron-beam machining (EBM), LASER-beam machining (LBM), ultrasonic machining (USM), plasma arc machining (PAM), abrasive jet machining (AJM) and related machines.
Protective coatings and hard facing; Modern welding processes. Automatic and semi-automatic machine tools and automatic transfer lines. Introduction to NC, CNC, and DNC.

ME 4131: Petroleum Engineering

3.0 Contact Hour 3.00 Credit Hour

Introduction: An overview of hydrocarbon reserves in Bangladesh, Classification of rocks and hydrocarbon deposits and their genesis.
Geophysical Exploration of Oil and Gas: Origin, accumulation, composition and behavior of hydrocarbon reserves, Analysis and prediction of reservoir performance.

Rigs: Drilling rigs and their types, Rig moving equipment, rig components and their auxiliaries.
Drilling operations: Vertical and direction drilling, Well logging and interpretation, Cracking and steaming, Well completion and cementation.

ME 4133: Composite Materials
3.0 Contact Hour 3.00 Credit Hour

Fibrous composites; Reinforcement types; Ply strength; Failure criteria; Layered laminate; Laminate stiffness; Laminate Strength; Residual stress; Thin-walled; Composite section; Inter laminar stresses; Hole in laminate; Bucking of laminates.

ME 4235: Operations Research

3.0 Contact Hour 3.00 Credit Hour

Introduction: Origin and development of OR, Art of modeling, Assumptions, Scope and limitations of OR models.
Linear Programming: Formulations (maximization and minimization) and graphical solution.
The Simplex Method: Development of the simplex method, Primal simplex method, Dual simplex Method, Special cases in simplex method application, Degeneracy, Alternative optima, Unbounded solution, Infeasible solution, Interpreting the simplex tableau: Sensitivity analysis, optimum solution, Status of resources, Dual price (use worth of a resource), Optimum solution, Status of availability, Maximum change in marginal profit/cost.
Duality: Definition of dual problem, Solution of the dual problem, Relationship between primal and dual, Objective values, Optimal dual solution, Economic interpretation of the dual problem, Revised simplex method.
Transportation Model: Definition and applications of the transportation model, Cases of balanced and unbalanced supply demand conditions, Solution of the transportation problem, North west corner rule, Vam, Russels-approximation method, Finding optimal solutions, The transshipment model.
The Assignment Model: Application areas, Hungarian method.
Integer Linear Programming: Illustrative applications of integer programming, Cutting plane method, Branch-and –Bound algorithm.
Dynamic (Multistage) Programming: Elements of the DP Model, State, Stage and decision variables, Forward and backward recursive equations, Examples of DP models and computations.
Decision Theory and Games: Decisions under risk, Decision trees, Decisions under uncertainty, Game theory, Optimal solution of two-person zero-sum games, Mixed strategies, Graphical solution of (m x 2) and (2 x m) games.
Queuing Models: Basic elements of the queuing model, Role of the Poisson and exponential distributions, pure birth and pure death processes, Pure birth model, Pure death model, Queues with combined arrivals and departures, Generalized Poisson model, Steady-state measures of

performance, Specialized Poisson Queues, M/M/1(α), M/M/c(α), M/M/c(k), Queues with bulk arrivals, Limitations of exact solution, Approximate solution technique of queues.
Simulation: Introduction, Methodology, Random, Simulation of Queuing models: Introduction to non- linear Programming.

ME 4237: Aerodynamics

3.0 Contact Hour 3.00 Credit Hour

History: History of Aeronautical Engineering.
Airfoils, Wings and Other Aerodynamic Shapes: Airfoil nomenclature, Lift, Drag and moment coefficients, Finite wing, Flaps.
Elements of Airplane Performance: Power & thrust required for level, Gliding, Flight and altitude effects on power available, Rate of climb, Gliding flight, Take off & landing performance.
Principles of Stability & Control: Static stability, Dynamic stability, Control, Navigation.
Propulsion: Jet propulsion, Turbojet engine, Turbofan engine, Ramjet engine, Rocket Jet engine.

ME 4239: Metal Cutting Process

3.0 Contact Hour 3.00 Credit Hour

Theory of metal cutting, mechanism of chip formation, chip breaker, chip-tool contact process, types of chip. Tool materials, tool design and manufacturing.
Theoretical and experimental determination of cutting forces; Heat phenomenon; Cutting fluid, Tool wear and tool life; Economics of metal cutting.
Gear and thread manufacturing processes.

ME 4241: Robotics

3.0 Contact Hour 3.00 Credit Hour

Introduction: Classification of robot systems, Pick and place devices, Continuous path manipulators, Telechirs, Wabots, Artificial grippers, Load capacities, Working volume and limits to accuracy of performance characteristics, Robot vision, Woe actuators, Obstacle avoidance, Movements strategies, Specific examples of robot applications and limitations of performance.
Programming and Response: Point to point programming, Higher level languages to teach mode programming, Space and tool co-ordinates, Computer office line programming, Programming for flexible manufacture, Human factors in the management of robot systems.
Kinematics of Robot Arms: Kinematics description of multi-degree of freedom manipulators, Joint co-ordinates, Task co-ordinates, Transformation of co-ordinate systems, Kinematics models, Industrial task description and translation of robot requirements.

Dynamics: Dynamic equation for six degree of freedom robot arms, Lagran and Newton Euler Viewpoints, Non linear systems of equations with time varying efficient, Real time dynamics and associated problems, Dynamic models predicted limits to performance in industrial tasks.
Control: Motion resolves, Passive complaint devices, Positive feed forward techniques in obstacle avoidance control, force feedback for gripper and arm control, Vision control for location in automated assembly.

ME 4243: CAD & CAM

3.0 Contact Hour 3.00 Credit Hour

Computer Aided Design (CAD): Methodology of interactive, Graphical, Engineering design, Discretization, Optimization and simulation in CAD, Algorithm development, Data structures of CAD, Engineering graphics and differential geometry in CAD, Geometric modeling, Application of geometrical design in conveyor systems, Sheet metal design, Design of pump and impeller surfaces, Practice on CAD.
Computer Aided Manufacturing (CAM): Numerical control machines, NC, CNC, DNC, Adaptive control of manufacturing process, Computer for process monitoring and control, Computer aided process planning (CAPP), Off line use of computer for production control, Computer types and languages for CAM, Flexible manufacturing system, Practice on CAM.

ME 4245: Servomechanism and Control Engineering

3.0 Contact Hour 3.00 Credit Hour

Orientation of control system, Open loop and feedback control system, Representation of control components and systems, Back diagrams, Transfer functions Modeling of Mechanical, Hydraulic Pneumatic, Electrical control components, Modeling of feedback systems, Back diagram algebra and single flow graphs.
Time response of first, second and higher order systems using classical and Laplace transform approaches, System stability analysis via Routh's stability criterion, Basic actions and system type classification, System analysis, Preliminary design by root locus method, Frequency response analysis, Use of Bode plot, Polar plots, Nichols chart, M and Joci, Gain- adjustment, Correlation between time and frequency response-margin.
Interconnected power system, Its development in Bangladesh, Introduction to modern control theory.

ME 4247: Energy and Environment
3.00 Contact hour 3.00 Credit Hour
Energy sources and utilization; Principles of energy conversion and storage. Building thermal energy-principles and optimization; Energy economy tools techniques; Environmental impacts of energy conversion; Environmental economics and management; Case studies.

5.3 Course Offered by ME Department to the students of other Departments

5.3.1 Department of Computer Science and Engineering

ME 1181: Basic Mechanical Engineering

3.00 Contact hour 3.00 Credit Hour

Sources of energy: conventional and renewable; Introduction to IC engines, Refrigeration and Air conditioning systems; Statics of particles and rigid bodies; Forces in trusses and frames; Relative motion; Kinematics of particles: Newton's Second Law of Motion; Kinematics of rigid bodies; Introduction to Robotics; Plane, rotational and spatial motion with applications to manipulators; Geometric configurations: structural elements, linkage, arms and grippers; Motion characteristics.

ME 1250: Engineering Drawing Sessional

3.00 Contact hour 1.50 Credit Hour

Introduction: Lettering, numbering and heading, instrument and their use, sectional views and isometric views of solid geometrical figures; Plan, elevation and section of multistoried buildings; Building services drawings, detailed drawing of lattice towers; Use of AutoCAD software.

5.3.2 Department of Electrical and Electronic Engineering

ME 1152: Engineering Drawing

Credit 1.50 Contact Hours 3.00

Introduction: Lettering, numbering and heading, Instruments and their uses; First and third angle projections; Orthographic drawings; Isometric views; Missing lines and views; sectional views and conventional practices; Auxiliary views.

ME 1263: Fundamentals of Mechanical Engineering

Credit 3.00 Contact Hours 3.00

Study of fuels, steam generating units with accessories and mountings, study of steam generators and turbines. Introduction to internal combustion engines and their cycles, study of SI engines, CI engines and gas turbines with their accessories. Refrigeration: Study of different refrigeration methods, refrigerants, refrigeration equipment, compressors, condensers, evaporators, expansion devices, other control and safety devices. Psychometrics, study of air-conditioning systems with their accessories. Types of fluid machinery, study of impulse and reaction turbines, Pelton wheel and Kaplan turbines, study of centrifugal and axial flow machines, pumps, fans, blowers and compressors, study of reciprocating pumps.

ME 1264: Fundamentals of Mechanical Engineering Sessional
Credit 1.50 Contact Hours 3.00
Students will perform experiments to verify practically the theories and concepts learned in ME 1263.

5.3.3 Department of Industrial and Production Engineering

ME 2171: Basic Thermodynamics
3.00 Contact Hour 3.00 Credit Hour
Fundamental concepts-heat, Work and energy; Thermodynamic System-state, Process and cycle; Kinetic theory of gasses; Properties of gases and vapors; Non-flow and flow processes; Laws of thermodynamics and their corollaries, Second law of thermodynamics: Availability, Irreversibility and entropy. Ideal gases and their power cycles: Vapor power cycles and gas power cycles; Refrigeration cycles and reciprocating compressors. Equations of state; Mixtures of gases and vapors; Real gases; Psychometrics; Fuels and combustion.

ME 2172: Basic Thermodynamics Sessional

3.00 Contact Hour 1.50 Credit Hour

Sessional based on ME 2101.

ME 2170: Mechanical Engineering Drawing- I

3.00 Contact Hour 1.50 Credit Hour

Introduction; Instruments and their uses; First and third angle projections; Orthographic drawings; Isometric views; Missing lines and views; Sectional views and conventional practices; Auxiliary views.

ME 2273: Engineering Materials

3.00 Contact Hour 3.00 Credit Hour

Introduction: Engineering materials, Materials cycle, Application and selection criteria of materials. Atomic structure & bonding: Elementary particles, Electronic distribution and atomic size/structure, Bonding-primary and secondary, Effect of bonding on material properties. Structure of solids: Crystalline nature of metals, Ceramics, Semiconductors and polymers; Crystal system/lattice/structure, Crystallographic indexing of planes & directions, Atomic aggregates and their structure, Significance of microstructure; Crystalline defects: Dimensions, Origin and their effect on properties; Amorphous structure.
Phase diagrams: Origin, Construction, Interpretation and application of binary phase diagrams with reference to a few important metallic and ceramic systems. Properties of materials:

Physical, Mechanical, Chemical, Electrical, Semi/super conducting, Magnetic, Optical, Thermal properties of solids; Units and testing.
Engineering materials: Structure, Properties, Processing, Fabrication and application of metals and alloys, Ceramics, Rubber, Plastics, Semiconductors and composites.

ME 2275: Mechanics of Materials

3.00 Contact Hour 3.00 Credit Hour

Stress analysis: Statically indeterminate axially loaded member, Axially loaded member, Thermal and centrifugal stresses; Stresses in thin and thick walled cylinders and spheres.
Beams: Shear force and bending moment diagrams; Various types of stresses in beams; Flexure formula; Deflection of beams: Integration and area moment methods; Introduction to reinforced concrete beams and slabs.
Torsion formula; Angle of twist; Modulus of rupture; Helical springs; Combined stresses: principal stress, Mohr's Circle; Columns: Euler's formula, intermediate column formulas, the Secant formula; Flexure formula of curved beams.
Introduction to experimental stress analysis techniques; Strain energy; Failure theories.
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ME 2274: Engineering Materials Sessional

1.50 Contact Hour 0.75 Credit Hour

Sessional works compatible to ME 2273.

ME 2276: Mechanics of Materials Sessional

1.50 Contact Hour 0.75 Credit Hour

Sessional works compatible to ME 2201.

ME 2270: Mechanical Engineering Drawing –II

3.00 Contact Hour 1.50 Credit Hour

Review of orthographic projections; Fasteners, Gears, Keys and springs; Sectional views and conventional practices; Auxiliary views; Specifications for manufacture; Working drawings; Plan and elevation of building; Computer aided Drawing; Computer Aided Design.

ME 3177: Fluid Mechanics and Machinery

3.00 Contact Hour 3.00 Credit Hour

Fluid statics: Basic hydrostatic equation, Pressure variation in static incompressible and compressible fluids; Forces on plane and curved surfaces. Continuity, Momentum and energy equations; Introduction to in viscid incompressible flow to include two dimensional basic flows. Dimensional analysis and similitude; Fundamental relations of compressible flow, Real fluid flow; Frictional losses in pipes and fittings, Introduction to boundary layer theory, Introduction to open channel flow.

Types of fluid machinery, Rotodynamic and positive displacement machines; Impulse and reaction turbines; Centrifugal and axial flow pumps; Dimensional analysis applied to fluid machinery: specific speed. Unit power. Unit speed, Unit discharge; Performance and characteristics of turbines and pumps; Cavitation; Reciprocating pump, Gear and scow pumps; Fans, Blowers and Compressors.

ME 3178: Fluid Mechanics and Machinery Sessional

3.00 Contact Hour 1.50 Credit Hour

Sessional works compatible to ME 3131.