

**MILITARY INSTITUTE OF SCIENCE AND TECHNOLOGY**



**SYLLABUS  
FOR THE DEGREE  
B. Sc. IN MECHANICAL ENGINEERING**

**Department of Mechanical Engineering  
January 2009**

## CHAPTER 1

### GENERAL INFORMATION

#### 1.1 Introduction

The necessity of establishing a technical institute for the Bangladesh Armed Forces was felt in the late eighties. In the absence of such an institution, officers of Bangladesh Armed Forces had been graduating from Bangladesh University of Engineering and Technology (BUET), Bangladesh Institute of Technology (BIT) and other foreign institutions of science and technology. With a view to meet the increasing demand for the development and dissemination of engineering and technological knowledge, Bangladesh Armed Forces established the Military Institute of Science and Technology (MIST) that promises to provide facilities for higher technical education both for the officers of Bangladesh Armed Forces as well as for civil students from home and abroad. The motto of MIST is “Technology for Advancement”. Founded on 19 April 1998, MIST started its journey on 31 January 1999 by offering a four-year bachelor's degree on Civil Engineering.

#### 1.2 Aim

The aim of MIST is to conduct undergraduate courses in various disciplines of Engineering and post graduate course in Business Administration for four/two academic years according to syllabi leading to Bachelor of Science in Engineering (B. Sc. Engineering) degrees to be conferred by the Bangladesh University of Professionals for officers of the armed forces and civil students from home and abroad.

#### 1.3 Objectives

The objectives of MIST are:

- To offer the following courses with a view to meet the increasing demand in the Armed Forces as well as in the country:
  - Four-year bachelor's courses in Civil Engineering (CE), Computer Science and Engineering (CSE), Electrical, Electronic and Communication Engineering (EECE), Mechanical Engineering (ME) and Aeronautical Engineering(AE)
- To produce well disciplined self-motivated, dedicated and skilled engineers, computer professionals and business administrative experts.
- To make provisions for research and development and dissemination of knowledge in appropriate fields of science and technology.

#### **1.4 Location**

MIST is located at Mirpur Cantonment, northwest edge of the greater Dhaka city, a hub of knowledge for the armed forces. Mirpur Cantonment is a small, calm and quiet education village and free from all possible pollution of a city life. A garland like lake with migratory birds, three sides with extended green fields in the summer and water bodies in the rainy season, whistling birds on the tree branches and overall bounty of nature adds to the already existing splendid academic atmosphere. Other neighbouring academic institutions are National Defence College (NDC) and Defense Services Command and Staff College (DSCSC) - two international standard education centers.

#### **1.5 Eligibility of Students for Admission in MIST**

The students must fulfil the following requirements:

- **For Bangladeshi Students**

Minimum qualifications to take part in the admission test are as follows:

- o Applicants must have passed SSC and HSC (or equivalent) examination in Science group with minimum GPA of 3.50(without 4<sup>th</sup> subject) in both.
- o In HSC (or equivalent) examination the applicant must have obtained minimum grade 'A -' (A minus) in the subjects of Mathematics, Physics and Chemistry each.
- o 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.
- o For O Level/Junior Cambridge and A Level/Senior Cambridge background students, the applicant 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.
- o Sex Category - Male and Female.

- **For Foreign Students**

Foreign student may also be admitted. Vacancies are offered to foreign through Armed Forces Division (AFD), Prime Minister's Office of the Government of the People's Republic of Bangladesh.

The candidates must fulfill the following requirements:

- o Equivalent qualifications as that of Bangladeshi Students.
- o Sex - Male and Female.
- o Must have security clearance from respective Embassy/ High Commission in Bangladesh.

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

## 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 in Bangla and English out of 200 marks (03 hours duration). The distribution of marks is given below:

<b>Ser</b>	<b>Subjects</b>	<b>Marks</b>
a.	Mathematics	80
b.	Physics	60
c.	Chemistry	40
d.	<u>English</u>	<u>20</u>
<b>Total =</b>		<b>200</b>

### 1.6.2 Final Selection

Students will be selected on the basis of results of the written admission test, GPA of SSC/equivalent examination without 4<sup>th</sup> subject and GPA of HSC/equivalent examination without 4<sup>th</sup> subject. Accumulated result will be evaluated according to the weight age of written admission test result -75%, GPA of SSC/equivalent examination without 4<sup>th</sup> subject-10% and GPA of HSC/equivalent examination without 4<sup>th</sup> subject.-15%. Individual choice for selection of departments will be given preference as far as possible. In case of tie in the result of admission test, difference will be judged on the basis of marks obtained in Mathematics, Physics, Chemistry and English respectively in admission test.

### 1.6.3 Medical Checkup

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

## 1.7 Students Withdrawal Policy

### 1.7.1 For Poor Academic Performance

In all the Degree Engineering programs, it is expected that all military and civil students will earn degree by clearing all the offered courses in the stipulated time.

In case of failure, the following policies will be adopted.

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- Students failing in maximum two courses/subjects in any level, each comprising of two regular terms will be allowed to appear in the referred/re-examination on failed course(s)/subject(s) after a short term as per academic schedule.
- Referred/re-examination, after short term, is to be conducted within 02 (two) weeks of commencement of the next academic session at the latest.
- Students failing in maximum one course/subject in the referred/re-examination will be promoted to the next higher level. The failed subject will be termed as 'Backlog' subject and the students have to pass the backlog subject in the next scheduled referred/re-examination, but without any short term. Otherwise, he/she will be withdrawn permanently from this institution.
- No student will be allowed to appear more than twice in the re-examinations on a particular course/subject in the whole undergraduate course.
- Students in all levels will be allowed to appear in the re-examination on two courses/subjects including the backlog one.
- Students will be promoted to the second term of each level irrespective of their results in the first term of the level.
- Students failing in three or more courses/subjects in any level, comprising of two regular terms, will be allowed to repeat the level once. Students repeating a level will be granted exemption for that/those subject(s) in which they earned "B+" or better grade in the previous academic year. For a military student, repeating a level will be subjected to the approval of the respective Service Headquarters.
- Students will be allowed to repeat a particular level only once in the whole undergraduate program.
- After Level-4 referred/re-examination, if any military student fails in maximum one course/subject, but not the backlog subject, then he/she will leave MIST and will be allowed to appear in the next scheduled re-examination of the respective course. In that examination if he/she cannot pass the course/subject or if he/she does not appear in the referred examination within 6 years of registration will lose the scope of completing graduation. This failure will also be recorded in the dossier of military officers.
- In case of sickness which leads to missing of more than 40% classes or miss term final examination (supported by requisite medical documents), students may be allowed to withdraw temporarily from that term and repeat the whole level with the regular level in the next academic session, subject to the approval of Academic Council, MIST.
- Whatever may be the cases, students have to complete the whole undergraduate program within 06 (Six) academic years from the date of registration.
- Failure to secure/achieve a minimum GPA of 2.20 in two consecutive levels will also lead to withdrawal of the student from the program.

## **1.7.2 Withdrawal on Disciplinary Ground**

### **1.7.2.1 Unfair Means**

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

- Communication with fellow students for obtaining help in the examination.
- Copying from another student's script/report/paper.
- Copying from desk or palm of a hand or from other incrimination documents.
- Possession of any incriminating document whether used or not.

### **1.7.2.2 Influencing Grades**

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

### **1.7.2.3 Other Indiscipline Behavior**

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

### **1.7.2.4 Immediate Action by the Disciplinary Committee of MIST**

The Disciplinary Committee, MIST may take immediate disciplinary action against any student of the Institution. In case of withdrawal/expulsion, the matter will be referred to the Academic Council, MIST for post-facto approval.

## **1.7.3 Withdrawal on Own Accord**

A student who has already completed some courses and has not performed satisfactorily may apply for a permanent withdrawal. A student, if he/she applies, may be allowed to withdraw temporarily from the program, subject to the approval of Academic Council of MIST, but he/she has to complete the whole program within 06 (six) academic years from the date of his/her registration.

## CHAPTER 2

### THE DEPARTMENT OF MECHANICAL ENGINEERING

#### 2.1 Introduction

Mechanical Engineering plays a vital role in all fields of modern human activities. It has established itself as one of the most important branches of engineering. The technical aspects of this branch of engineering are often categorized by terms like energy including its transformation from one form to another, its transmission and utilization, and on applied mechanics and design. The Mechanical Engineering under graduate programme provide excellent technical background for persons who want to work in the field of fluid mechanics, heat transfer, environmental pollution control and other disciplines. In addition to lectures and practical session in the classroom, the under graduate programme also include industrial visits and on-site industrial training. The new generation of Mechanical engineers is encouraged to undertake research and development activities in the above areas and this department is committed to the study and analysis of fundamental as well as applied problems. Problems of military and national importance have consequently received great emphasis in the activities of this department.

In addition to the above in the future there will be opportunities for postgraduate studies and research leading to a higher degrees i.e. M. Sc. (Engg), M. Engg, and Ph.D. There are financial assistance program for the poor and meritorious students too.

#### 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) Heat Transfer Lab
- (4) Material & Production Process Lab
- (5) Refrigeration & Air Conditioning Lab
- (6) Applied Thermodynamics (Heat Engine) Lab
- (7) Applied Mechanics Lab
- (8) Machine Tools Lab
- (9) Measurement & Quality Control lab
- (10) Aerodynamics Lab
- (11) Drawing Shop
- (12) Instrumentation and Control Lab

Students in Level - 1 (fresher) and Level - 2 (sophomore) have to undertake laboratory courses (sessionals) in Physics, Chemistry, Workshop, Electrical Engineering and Civil 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

## RULES AND REGULATIONS FOR UNDERGRADUATE PROGRAM

## 3.1 Number of Terms in a Year (Level)

There will be two regular terms (Term I and Term II) in an academic year. Those who will not be able to clear all the subjects, will require to appear in the re-examination after a short term of about 6 weeks and fulfilling the other conditions as per examination policy.

## 3.2 Duration of Terms

The duration of each of Term will be as follows:

Events	Durations			Remarks
	Academic	Others	Total	
Classes	7 weeks			
Mid Term vacation		1 week		
Classes (7 weeks min), Makeup Classes and Preparatory leave	9 Weeks			
Term Final Examination	2 weeks			
Term End Vacation		2 week		May change
<b>Total</b>	18 weeks	3 weeks	<b>21 weeks</b>	

The duration for short term and re examination will be as follows:

Short term/ Preparatory Leave	* 6 weeks	* Duration may vary depending on the situation.
Examination	1 weeks	
<b>Total</b>	<b>7 Weeks</b>	

## 3.3 Course Pattern and Credit Structure

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

## 3.3.1 Course Designation System

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

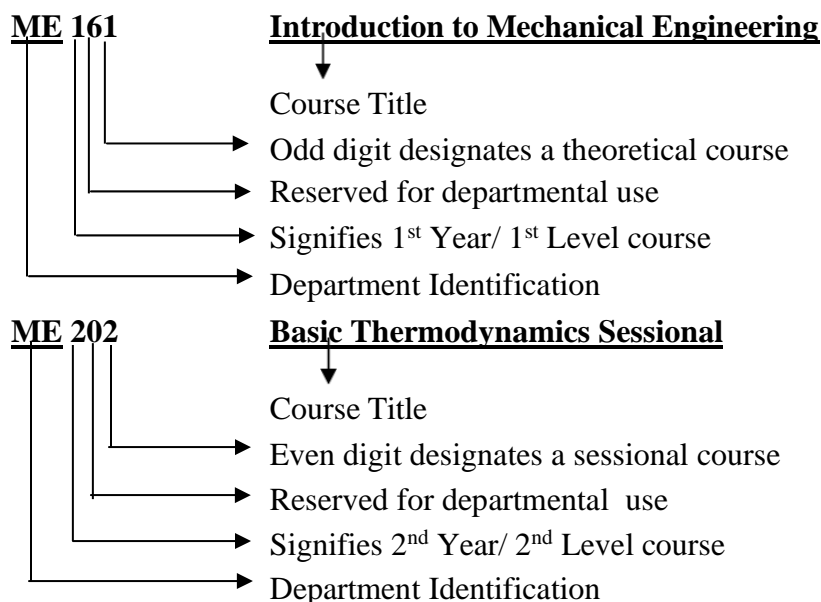
\* The first digit corresponds to the year/level in which the course is normally taken by the students. The second digit is reserved for departmental use. It usually identifies a specific area/group of study within the department

\* The last digit is an odd number for theoretical courses and an even number for laboratory courses.

\* The course designation system is illustrated as follows:



(Example.....)



### 3.3.2 Assignment of Credits

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

- For theoretical courses one hour lecture per week per term is equivalent to one credit.
- For laboratory courses two hours sessional per week per term is equivalent to one credit.
- Credits are also assigned to project work taken by the students. The amount of credits assigned to such works may vary from one discipline to another.

### 3.3.3 Types of Courses

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

- **Core Courses**  
 In each discipline, a number of courses are identified as core courses, which form the nucleus of the respective bachelor's degree program. A student has to complete all of the designated core courses of his/her discipline.
- **Prerequisite Courses**  
 Some of the core courses are identified as prerequisite courses for a specific subject. A prerequisite course is one, which is required to be completed before some other course(s) can be taken.
- **Elective Courses**  
 Apart from the core courses, the students can choose from a set of Elective courses. A required number of Elective courses from a specified group have to be chosen.

### 3.4 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 quizzes, class evaluation, class participation, homework assignment and a term final examination. The assessment in laboratory courses is made by evaluating performance of the students at work during the class, viva-voce during laboratory hours and quizzes. 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. A minimum number of earned credits also have to be acquired in order to qualify for the degree. Letter grades and corresponding grade points will be awarded in accordance to the provisions shown below:

Numerical Marks	Letter Grade	Grade Points
80% and above	A+	4.00
75% to less than 80%	A	3.75
70% to less than 75%	A-	3.50
65% to less than 70%	B+	3.25
60% to less than 65%	B	3.00
55% to less than 60%	B-	2.75
50% to less than 55%	C+	2.50
45% to less than 50%	C	2.25
40% to less than 45%	D	2.00
< 40%	F*	0.00
-	I	Incomplete
-	W	Withdrawn
-	X	Project/Thesis continuation

\* Subject in which the student gets F grades shall not be counted towards credit hours requirements and for the calculation of Grade Point Average (GPA). However, all grade obtained by a student including F grade will be reflected in his/her grade sheet/transcript.

#### 3.4.2 Distribution of Marks( For Theoretical course only)

Thirty percent (30%) of marks of a theoretical course shall be allotted for continuous assessment, i.e. quizzes, home assignments, class evaluation and class participation. The rest of the marks will be allotted to the Term Final Examination that is conducted centrally by the Dhaka University. There are internal and external examiners for each course in the Term Final Examination of 3-hour duration. Distribution of marks for a given course is as follows:

Class Participation/Observation	5%
Class Attendance	5%
Homework assignment and quizzes	20%
Final Examination (3 hours)	70%
<b>Total</b>	<b>100%</b>

Basis for awarding marks for attendance will be as follows:

	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%
Below 60%	00%

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

### 3.4.3 Calculation of GPA

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

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

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

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

(Example.....

- **A Numerical Example**

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

Course	Credits, C <sub>i</sub>	Grade	Grade Points, G <sub>i</sub>	C <sub>i</sub> *G <sub>i</sub>
ME 160	1.50	A-	3.50	5.250
ME 165	3.00	A+	4.00	12.000
CHEM 101	3.00	A	3.75	11.250
MATH 141	3.00	B	3.00	9.000
HUM 101	3.00	B-	2.75	8.250
HUM 103	3.00	B	3.00	9.000
PHY 105	3.00	A+	4.00	12.000
CSE 102	1.50	A	3.75	5.625
<b>Total</b>	<b>21.00</b>			<b>72.375</b>

$$\text{GPA} = 72.375/21.00 = 3.45$$

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

Level	Term	Credit Hours Earned, TC <sub>i</sub>	GPA Earned, GPA <sub>i</sub>	GPA <sub>i</sub> *TC <sub>i</sub>
1	1	21.00	3.73	78.330
1	2	20.50	3.93	80.565
2	1	19.75	3.96	78.210
2	2	20.25	4.00	81.000
<b>Total</b>		<b>81.50</b>		<b>318.105</b>

$$\text{CGPA} = 318.105/81.50 = 3.90$$

### 3.4.4 Minimum Earned Credit and GPA Requirement for Obtaining Degree

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

### 3.5 Absence during a Term

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

## CHAPTER 4

## COURSE REQUIREMENT FOR THE UNDERGRADUATE STUDY OF MECHANICAL ENGINEERING

### 4.1 Introduction

The list of courses offered to the Undergraduate students of Mechanical Engineering (ME) is categorized into Core courses and Elective courses. Some of the core courses are offered by the Department of ME and some of these are offered by other departments. Students have the flexibility to choose from amongst the Elective courses.

### 4.2 Core Courses

The students have to complete all the core courses enlisted below.

#### 4.2.1 List of Course offered by ME Department to ME Students (Core Courses)

Course No	Course Name	Level/ Term	Contact Hours	Credit Hours
ME 160	Mechanical Engineering Drawing –I	1-I	3.0	1.50
ME 161	Introduction to Mechanical Engineering	1-I	3.0	3.00
ME 171	Computer Programming Language	1-II	3.0	3.00
ME 172	Computer Programming Language Sessional	1-II	3.0/2	0.75
ME 201	Basic Thermodynamics	2-I	4.0	4.00
ME 202	Basic Thermodynamics Sessional	2-I	3.0/2	0.75
ME 241	Engineering Mechanics	2-I	4.0	4.00
ME 243	Mechanics of Solids	2-II	3.0	3.00
ME 244	Mechanics of Solids Sessional	2-II	3.0/2	0.75
ME 260	Mechanical Engineering Drawing –II	2-II	3.0	1.50
ME 261	Numerical Analysis	2-II	3.0	3.00
ME 262	Numerical Analysis Sessional	2-II	3.0/2	0.75
ME 291	Metallic Materials	2-II	3.0	3.00
ME 292	Metallic Materials Sessional	2-II	3.0/2	0.75
ME 301	Conduction and Radiation Heat Transfer	3-I	3.0	3.00
ME 302	Heat Transfer Sessional	3-I	3.0/2	0.75
ME 303	Convection, Boiling, Condensation and Mass Transfer	3-II	3.0	3.00
ME 304	Heat and Mass Transfer Sessional	3-II	3.0/2	0.75
ME 321	Fluid Mechanics-I	3-I	3.0	3.00
ME 322	Fluid Mechanics Sessional-I	3-I	3.0/2	0.75
ME 323	Fluid Mechanics – II	3-II	3.0	3.00
ME 324	Fluid Mechanics Sessional – II	3-II	3.0/2	0.75
ME 331	Production Process	3-II	4.0	4.00
ME 332	Production Process Sessional	3-II	3/2	0.75
ME 341	Machine Design-I	3-I	3.0	3.00
ME 342	Machine Design Sessional – I	3-I	3.0/2	0.75
ME 343	Machine Design-II	3-II	3.0	3.00
ME 344	Machine Design Sessional	3-II	3.0/2	0.75

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ME 345	Mechanics of Machinery	3-I	4.0	4.00
ME 346	Mechanics of Machinery Sessional	3-I	3.0	1.50
ME 361	Instrumentation and Measurement	3-I	3.0	3.00
ME 362	Instrumentation and Measurement Sessional	3-I	3.0/2	0/75
ME 370	Industrial Training	3-II	4 weeks	Sat
ME 372	Industrial Training	3-II	4 weeks	0.75
ME 381	Measurement and Quality Control	3-II	3.0	3.00
ME 382	Measurement and Quality Control Sessional	3-II	3/2	0.75
ME 400	Project and Thesis-I	4-I 4-II	6.0 + 6.0	3.00 + 3.00
ME 401	Internal Combustion Engines	4-I	3.0	3.00
ME 402	Heat Engines Sessional	4-I	3.0/2	0.75
ME 403	Power Plant Engineering	4-II	3.0	3.00
ME 404	Steam Laboratories Sessional	4-II	3.0/2	0.75
ME 421	Fluid Machinery	4-I	3.0	3.00
ME 422	Fluid Machinery Sessional	4-I	3.0/2	0.75
ME 431	Machine Tools	4-I	3.0	3.00
ME 432	Machine Tools Sessional	4-I	3/2	0.75
ME 481	Industrial Management	4-II	4.0	4.00

**4.2.2 List of Courses offered by other departments to ME Students**

Course No	Course Name	Level/ Term	Contact Hours	Credit Hours
Phy 102	Physics Sessional	1-II	3.0	0.75
Phy 105	Structure of Matter, Electricity & Magnetism and Modern Physics	1-I	3.0	3.00
Phy 107	Waves and Oscillation, Geometrical Optics and Wave Mechanics	1-II	3.0	3.00
Chem 101	Chemistry-I	1-I	3.0	3.00
Chem 114	Inorganic Quantitative Analysis Sessional	1-I	3.0	1.50
Chem 141	Chemistry of Engineering Materials	1-II	3.0	3.00
Math 161	Differential and Integral Calculus	1-I	4.0	4.00
Math 163	Vector analysis, Matrices and Geometry	1-II	4.0	4.00
Math 261	Ordinary and partial Differential Equations	2-I	4.0	4.00
Math 263	Fourier Analysis, Harmonic functions, Laplace Transform and Complex variable	2-II	4.0	4.00
Hum 101	English	1-II	2.0	2.00
Hum 102	Technical Report Writing and Presentation	1-II	3.0	1.50
Hum 201	Sociology	2-I or 2-II	3.0	3.00
Hum 203	Government	2-I or 2-II	3.0	3.00
Hum 213	Principles of Accounting	2-I	3.0	3.00
Hum 223	Economics	2-I or 2-II	3.0	3.00
Hum 227	Industrial Sociology	2-I or 2-II	3.0	3.00
EECE 159	Fundamentals of Electrical Engineering	1-I	3.0	3.00
EECE 160	Fundamentals of Electrical Engineering Sessional	1-I	3.0/2	0.75
EECE 259	Electrical and Electronics Technology	2-I	4.0	4.00
EECE 260	Electrical and Electronics Technology Sessional	2-I	3.0/2	0.75

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Shop 160	Foundry and Welding shops	1-I	3.0/2	0.75
Shop 170	Machine Shop Practice	1-II	3.0/2	0.75

**NOTE:** The courses in shaded areas have prerequisite courses.

**4.2.3 List of Courses Offered by ME Department to ME Students (Elective Courses)**

Course No	Course Name	Level-Term	Contact Hours	Credit Hours
ME 405	Refrigeration and Building mechanical systems	4-I or 4-II	3.0	3.00
ME 407	Advanced Thermodynamics	4-I or 4-II	3.0	3.00
ME 409	Renewable Energy	4-I or 4-II	3.0	3.00
ME 411	Combustion and Pollution	4-I or 4-II	3.0	3.00
ME 413	Energy and Environment	4-I or 4-II	3.0	3.00
ME 423	Fluid Engineering	4-I or 4-II	3.0	3.00
ME 425	Aerodynamics	4-I or 4-II	3.0	3.00
ME 427	Applied Engineering Mathematics	4-I or 4-II	3.0	3.00
ME 429	Gas Dynamics	4-I or 4-II	3.0	3.00
ME 433	Fluidics	4-I or 4-II	3.0	3.00
ME 437	Design of Fluid Machines	4-I or 4-II	3.0	3.00
ME 439	Biomedical Fluid Mechanics	4-I or 4-II	3.0	3.00
ME 441	Theory of Structures	4-I or 4-II	3.0	3.00
ME 445	Noise and Vibration	4-I or 4-II	3.0	3.00
ME 447	Robotics	4-I or 4-II	3.0	3.00
ME 449	Composite Materials	4-I or 4-II	3.0	3.00
ME 451	Aircraft & Aero-engine Structure	4-I or 4-II	3.0	3.00
ME 453	Applied aerodynamics	4-I or 4-II	3.0	3.00
ME 455	Aircraft stability and control and Aircraftsystems	4-I or 4-II	3.0	3.00
ME 463	Petroleum Engineering	4-I or 4-II	3.0	3.00
ME 465	Applied Statistics	4-I or 4-II	3.0	3.00
ME 467	Automobile Engineering	4-I or 4-II	3.0	3.00
ME 469	Nuclear Engineering	4-I or 4-II	3.0	3.00
ME 471	Bio-Engineering	4-I or 4-II	3.0	3.00
ME 473	Plastic Process Technology	4-I or 4-II	3.0	3.00
ME 475	Modern Manufacturing Technology	4-I or 4-II	3.0	3.00
ME 477	Metal Cutting Processes	4-I or 4-II	3.0	3.00
ME 479	CAD/CAM	4-I or 4-II	3.0	3.00
ME 483	Production Planning and Control	4-I or 4-II	3.0	3.00
ME 491	Operations Research	4-I or 4-II	3.0	3.00
ME 493	Material Handling	4-I or 4-II	3.0	3.00
ME 495	Mechatronics	4-I or 4-II	3.0	3.00
ME 497	Textile Technology	4-I or 4-II	3.0	3.00
ME 415	Hydrostatic and Stability of Ships and Marine Vehicles	4-I or 4-II	3.0	3.00
ME 417	Shipbuilding Technology	4-I or 4-II	3.0	3.00
ME 419	Resistance and Propulsion of Ships	4-I or 4-II	3.0	3.00
ME 457	Ship Structure	4-I or 4-II	3.0	3.00

**NOTE:** The courses in shaded areas have prerequisite courses.

**4.2.4 Prerequisite Courses for ME Students**

<b>Course No</b>	<b>Course Title</b>	<b>Prerequisite Course No</b>
ME 243	Mechanics of Solids	ME 241
ME 260	Mechanical Engineering Drawing II	ME 160
ME 261	Numerical Analysis	ME 171
ME 323	Fluid Mechanics II	ME 321
ME 341	Machine Design I	ME 243
ME 343	Machine Design II	ME 243
ME 345	Mechanics of Machinery	ME 241
ME 370	Industrial Training	Completion of Level 2
ME 400	Project and Thesis I	Completion of Level 3
ME 401	Internal combustion Engines	ME 201
ME 403	Power plant Engineering	ME 201
ME 407	Advanced Thermodynamics	ME 201
ME 421	Fluid Machinery	ME 323
ME 423	Fluid Engineering	ME 323
ME 425	Aerodynamics	ME 323
ME 429	Gas Dynamics	ME 323
ME 433	Fluidics	ME 323
ME 437	Design of Fluid Machines	ME 323
ME 439	Bio-medical Fluid Mechanics	ME 323
ME 441	Theory of Structures	ME 243
ME 415	Hydrostatic and Stability of Ships and Marine Vehicles	ME 321 & ME 323
ME 417	Shipbuilding Technology	ME 331
ME 419	Resistance and Propulsion of Ship	ME 321 & ME 323
ME 457	Ship Structure	ME 243

**NOTE:** Satisfactory class performance of any prerequisite subjects will fulfill its condition as prerequisite.

**4.2.5 Final Year Project/Thesis**

Project/thesis will have to be undertaken by students under a supervisor in partial fulfillment of the requirement of his degree. Credit allotted to the project/thesis will be 6 having 12 contact hours.



## 4.2.6 Term Wise Distribution of Courses for B.Sc. Engg. (Mech) degree

*LEVEL- 1 TERM-1*

Course No	Course Name	Type of Course	Contact hours	Credit Hours
Phy 105	Structure of Matter, Electricity and Magnetism and Modern Physics	Theory	3	3.00
Chem 101	Chemistry-1	Theory	3	3.00
Math 161	Differential and Integral Calculus	Theory	4	4.00
ME 161	Introduction to Mechanical Engineering	Theory	3	3.00
EECE 159	Fundamentals of Electrical Engineering	Theory	3	3.00
			16	16.00
Chem 114	Inorganic Quantitative Analysis Sessional	Sessional	3	1.50
EECE 160	Fundamental of Electrical Engineering Sessional	Sessional	3/2	0.75
Shop 160	Foundry and Welding Shop Sessional	Sessional	3/2	0.75
ME 160	Mechanical Engineering Drawing-1	Sessional	3	1.50
			9	4.50
<b>Contact hours: 25.0; Credit hours: 20.50</b>				

*LEVEL-1 TERM-II*

Course No	Course Name	Type of Course	Contact hours	Credit Hours
Phy 107	Waves and Oscillation, Geometrical Optics and Wave Mechanics	Theory	3	3.00
Chem 141	Chemistry of Engineering Materials	Theory	3	3.00
Math 163	Vector analysis, Matrices and Geometry	Theory	4	4.00
ME 171	Computer Programming Language	Theory	3	3.00
Hum 101	English	Theory	2	2.00
			15	15.00
Hum 102	Technical Report Writing and Presentation	Sessional	3	1.50
Phy 102	Physics Sessional	Sessional	3	1.50
ME 172	Computer Programming Language Sessional	Sessional	3/2	0.75
Shop 170	Machine Shop Practice	Sessional	3/2	0.75
			9.0	4.50
<b>Contact hours: 24.0; Credit hours: 19.50</b>				

RESTRICTED

**LEVEL -2, TERM - 1**

Course No	Course Name	Type of course	Contact hours	Credit hours
ME 241	Engineering Mechanics	Theory	4	4.00
EECE 259	Electrical and Electronics Technology	Theory	4	4.00
Math 261	Ordinary and partial Differential Equation	Theory	4	4.00
ME 201	Basic Thermodynamics	Theory	4	4.00
Hum <sup>1</sup>	Select from the prescribed courses	Theory	3	3.00
			19	19.00
EECE 260	Electrical and Electronics Technology Sessional	Sessional	3	1.50
ME 202	Basic Thermodynamics Sessional	Sessional	3/2	0.75
			4.5	2.25
<i>Contact hours : 23.5; Credit hours : 21.25</i>				

**LEVEL-2, TERM -II**

Course No	Course Name	Type of course	Contact hours	Credit hours
ME 291	Metallic Materials	Theory	3	3.00
ME 261	Numerical Analysis	Theory	3	3.00
ME 243	Mechanics of Solids	Theory	3	3.00
Math 263	Fourier Analysis, Harmonic functions, Laplace Transform and Complex variable	Theory	4	4.00
Hum <sup>1</sup>	Select from the prescribed courses	Theory	3	3.00
			16	16.00
ME 292	Metallic Materials Sessional	Sessional	3/2	0.75
ME 262	Numerical Analysis Sessional	Sessional	3/2	0.75
ME 244	Mechanics of solids Sessional	Sessional	3/2	0.75
ME 260	Mechanical Engineering Drawing -II	Sessional	3	1.50
			7.5	3.75
<b>Contact hours: 23.5; Credits hours: 19.75</b>				

RESTRICTED

**LEVEL – 3, TERM –I**

Course No	Course Name	Type of course	Contact hours	Credit hours
ME 341	Machine Design –1	Theory	3	3.00
ME 321	Fluid Mechanics – 1	Theory	3	3.00
ME 345	Mechanics of Machinery	Theory	4	4.00
ME 301	Conduction and Radiation Heat Transfer	Theory	3	3.00
ME 361	Instrumentation and Measurement	Theory	3	3.00
			16	16.00
ME 342	Machine Design Sessional – 1	Sessional	3/2	0.75
ME 322	Fluid Mechanics Sessional – 1	Sessional	3/2	0.75
ME 346	Mechanics of Machinery Sessional	Sessional	3	1.50
ME 302	Heat Transfer Sessional	Sessional	3/2	0.75
ME 362	Instrumentation and Measurement Sessional	Sessional	3/2	0.75
			9	4.50
<b>Contact hours: 25.0; Credit hours: 20.50</b>				

**LEVEL –3, TERM – II**

Course No	Course Name	Type of course	Contact hours	Credit hours
ME 331	Production Processes	Theory	4	4.00
ME 323	Fluid Mechanics – II	Theory	3	3.00
ME 343	Machine Design – II	Theory	3	3.00
ME 381	Measurement and Quality Control	Theory	3	3.00
ME 303	Convection, Boiling, Condensation and Mass Transfer	Theory	3	3.00
			16	16.00
ME 332	Production Process Sessional	Sessional	3/2	0.75
ME 324	Fluid Mechanics Sessional – II	Sessional	3/2	0.75
ME 344	Machine Design Sessional - II	Sessional	3/2	0.75
ME 382	Measurement and Quality Control Sessional	Sessional	3/2	0.75
ME 304	Heat and Mass Transfer Sessional	Sessional	3/2	0.75
ME 372	Industrial Training	Training	4 weeks	0.75
			7.5 + 4 weeks	4.50
<b>Contact hours : 23.5 + 04 Weeks ; Credit hours : 20.50</b>				

\*\* It will be conducted after the completion of Level- 3, at any convenient time as can be arranged by the Department.

RESTRICTED

**LEVEL – 4, TERM – 1**

Course No	Course Name	Type of course	Contact hours	Credit hours
ME 421	Fluid Machinery	Theory	3	3.00
ME 431	Machine Tools	Theory	3	3.00
ME 401	Internal Combustion Engines	Theory	3	3.00
Optional I <sup>2</sup>	Selected from prescribed optional subjects	Theory	3	3.00
Optional II <sup>2</sup>	Selected from prescribed optional subjects	Theory	3	3.00
			15	15.00
ME 422	Fluid Machinery Sessional	Sessional	3/2	0.75
ME 432	Machine Tools Sessional	Sessional	3/2	0.75
ME 402	Heat Engines Sessional	Sessional	3/2	0.75
ME 400	Project and Thesis – 1	Sessional	6	3.00
			10.5	5.25
<b>Contact hours: 25.5; Credit hours: 20.25</b>				

**LEVEL – 4, TERM – II**

Course No	Course Name	Type of course	Contact hours	Credit hours
ME 403	Power Plant Engineering	Theory	3	3.00
Optional III <sup>2</sup>	Selected from prescribed optional subjects	Theory	3	3.00
Optional IV <sup>2</sup>	Selected from prescribed optional subjects	Theory	3	3.00
Optional V <sup>2</sup>	Selected from prescribed optional subjects	Theory	3	3.00
ME 481	Industrial Management	Theory	4	4.00
			16	16.00
ME 404	Steam Laboratories Sessional	Sessional	3/2	0.75
ME 400	Project and thesis – II	Sessional	6	3.00
			7.5	3.75
<b>Contact hours: 23.5; Credit hours: 19.75</b>				

**Notes :**

- Students can choose from a number of humanities courses as follows, offered by Humanities Department :  
 Hum 201 : Sociology  
 Hum 203 : Government  
 Hum 213 : Principles of Accounting.  
 Hum 223 : Economics  
 Hum 227 : Industrial Sociology
- Students can choose from optional courses offered by the Department of Mechanical Engineering.
- The courses in shaded areas have prerequisite courses.
- The minimum credit hour requirement for B. Sc. Engg. (Mech) degree is 162.00.

**4.2.7 Contact Hours and Credit Hours in Eight Terms**

Level Term	Contact hours for theory courses	Contact hours for sessional courses	Cumulative contact hours	Cumulative credit hours
1-I	16.0	9.0	25.00	20.50
1-II	15.0	9.0	49.00	40.00
2-I	19.0	4.5	72.50	61.25
2-II	16.0	7.5	96.00	81.00
3-I	16.0	9.0	121.00	101.50
3-II	16.0	7.5 + 04 Weeks	144.50+ 04 Weeks	122.00
4-I	15.0	10.5	170.00+ 04 Weeks	140.25
4-II	16.0	7.5	193.50+ 04 Weeks	162.00
Total	129.0	64.5+ 04 Weeks	193.50+ 04 Weeks	162.00

**4.2.8 Distribution of Credit Hours for Different Categories of Courses**

Level-Term	Humanities Cr Hr	Math Cr Hr	Basic Science Cr Hr	Dept Engg Cr Hr	Allied Engg Cr Hr	Optional Courses Cr Hr	Total Cr Hr
1-I	-	4+0.0	6+1.5	3+2.25	3+0.75	-	20.50
1-II	2+1.5	4+0.0	6+1.5	3+1.50	-	-	19.50
2-I	3+0.0	4+0.0	-	8+0.75	4+1.5	-	21.25
2-II	3+0.0	4+0.0	-	6*+3.0	3+0.75	-	19.75
3-I	-	-	-	16+4.5	-	-	20.50
3-II	-	-	-	9+3.00	7+1.5	-	20.50
4-I	-	-	-	6+4.5	3+0.75	6**+0.0	20.25
4-II	-	-	-	3+3.75	4***+0.0	9**+0.0	19.75
% of total theory course	6.2	12.4	9.3	41.86	18.6	11.63	
% of total course	5.86	9.88	9.26	47.69	18.06	9.23	

\* 3 credit hours of which is a mathematics course (ME 261) offered by ME Dept.

\*\* Students can take courses offered by ME and/or IPE Dept.

\*\*\* 4 credit hours of which is a humanities courses (IPE 481) offered by IPE Dept.

## CHAPTER 5

### 5.0 DETAIL OUTLINE OF UNDERGRADUATE COURSES OFFERED BY ME DEPARTMENT TO ME STUDENTS

#### **ME 160 : 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.

#### **Text and Ref books:**

1. Metric Drafting – Paul Wallah, Publisher – Glenceo Publishing Co, Inc; 1979.
2. Drafting Technology and Practice – William P. Spence, Publisher – Chas A. Bennett Co, Inc, 1973.
3. Technical Drawing – Frederick E Giesecke, Alva Mitchell, Henry C. Spencer, Publisher – Prentice Hall; 12 edition, 2002.

#### **ME 161 : Introduction to Mechanical Engineering**

3.00 Contact Hour 3.00 Credit Hour

Study of sources of energy: conventional and renewable, environmental pollution; study of steam generation units with their accessories and mountings; Introduction to steam turbine with their accessories, internal combustion engines and gas turbines with their accessories, automobiles; Introduction to pumps, blowers and compressors, refrigeration and air-conditioning systems, Engineering ethics, occupational health and safety and international standards.

#### **Text and Ref books:**

1. Heat Engines – D. A. Low, Principles of Energy Conversion – A W Culp, Publisher – Mc Graw-Hill Senes 1999.
2. Basic Mechanical Engineering – R. K. Rajput, Publisher – Laxmi Publishers (P) Ltd, 1999.

#### **ME 171 : Computer Programming Language**

3.00 Contact Hour 3.00 Credit Hour

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

Introduction to structured programming; Overview of C and C++ programming languages; 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. Introduction and familiarization with MATLAB software.

#### **Text and Ref books:**

1. C Programming using Turbo C++ (2<sup>nd</sup> edition) – Robert Lafore, Publisher – Tech media.
2. Turbo C/C++: The complete reference (2<sup>nd</sup> edition) – Herber Schildt, Publisher- Osborne Mc Graw-Hill.

#### **ME 172 : Computer Programming Language Sessional**

1.50 Contact Hour, 0.75 Credit Hour

Sessional based on ME 171.

**ME 201 : Basic Thermodynamics**

4.00 Contact Hour 4.00 Credit Hour

Fundamental concepts; Properties of gases and vapours; Laws of thermodynamics and their corollaries. Non-flow and flow processes; Ideal gases and their cycles; Power cycles, refrigeration cycles and reciprocating compressors; Second law of thermodynamics: availability, irreversibility and entropy. Thermodynamic relations and equations of state; Mixtures of gases and vapours; Psychrometrics; Real gases; Fuels and combustion.

**Text and Ref books:**

1. Fundamentals of Thermodynamics – R E Sonntag, C. Borgnakke, G J. Van Wylen, Publisher – John Wiley & Sons, Inc, 5<sup>th</sup> edition, 2000.

**ME 202 : Basic Thermodynamics Sessional**

3/2 Contact Hour 0.75 Credit Hour

Sessional based on ME 201.

**ME 241 : Engineering Mechanics**

4.00 Contact Hour 4.00 Credit Hour

Basic concepts of mechanics; Statics of particles and rigid bodies; Centroids of lines, areas and volumes; Forces in truss, frames, and cables; Friction; Moments of inertia of areas and masses; Relative motion.

Kinetics of particles: Newton's second law of motion; Principles of work, energy, impulse and momentum; System of particles; Kinematics of rigid bodies; Kinetics of plane motion of rigid bodies: forces and acceleration; Principles of work and energy.

**Text and Ref books:**

1. Vector Mechanics for Engineers: Statics and Dynamics – Ferdinand P. Beer, E Russell Jr. Johnstone, Publisher – Mc Graw-Hill Companies, 5<sup>th</sup> edition 1988.
2. Engineering Mechanics, Statics and Dynamics – Joseph F Shelley, Publisher – Mc Graw-Hill, 1980.

**ME 243 : Mechanics of Solids**

3.00 Contact Hour 3.00 Credit Hour

*Prereq.: ME 241*

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.

**Text and Ref books:**

1. Strength of Materials (4<sup>th</sup> edition) – Andrew Pytel, Ferdinand L. Singer.
2. Strength of materials (4<sup>th</sup> edition) William Nash, Publisher Mcgraw-hill International Editions, Schaum's Outline Series.
3. Strength of Materials – Beer and John Stone.
4. Strength of Materials – Popov.

**ME 244 : Mechanics of Solids Sessional**

3/2 Contact Hour 0.75 Credit Hour

Experiments based on ME 243

**ME 260 : Mechanical Engineering Drawing –II**

3.00 Contact Hour 1.50 Credit Hour

*Prereq.: ME 160*

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

**Text and Ref books:**

1. Metric Drafting – Paul Wallah, Publisher – Glenceo Publishing Co, Inc; 1979.
2. Drafting Technology and Practice – William P. Spence, Publisher – Chas A. Bennett Co, Inc, 1973.
3. Technical Drawing – Frederick E Giesecke, Alva Mitchell, Henry C. Spencer, Ivan Leroy Hill, John T. Dygdon, James E. Novak, Ival L. Hill, Publisher – Prentice Hall; 12 edition, 2002.

**ME 261 : Numerical Analysis**

3.00 Contact Hour 3.00 Credit Hour

*Prereq.: ME 171*

Roots of polynomials and transcendental equations; Determinants and matrices; Eigen values and eigen vectors; Solution of linear and non-linear algebraic equations; Solution of first-order differential equations.

Interpolation methods; Numerical differentiation and integration; Solving equations by finite differences; Curve fitting.

**Text and Ref books:**

1. Applied Numerical Analysis (5<sup>th</sup> edition) – Curtis F. Gerald, Patrick O. wheatley, Publisher-Addison-Wesley Publishing Company.
2. Numerical Methods for Engineers (4<sup>th</sup> edition) – Steven C. Chopra, Raymond P. Carale, Publisher – Tata McGraw-Hill Publishing Company Ltd.

**ME 262 : Numerical Analysis Sessional**

3/2 Contact Hour 0.75 Credit Hour

Numerical solution of problems in Engineering. Introduction to CAD.



**ME 301 : Conduction and Radiation Heat Transfer**

3.00 Contact Hour 3.00 Credit Hour

Basic modes of heat transfer; General conduction equation for one dimensional and three dimensional situation; Steady state conduction in different geometrics and composite structures for one dimensional situation; Effect of variable thermal conductivity; Analysis of heat conduction of system with heat sources and heat transfer from finned surfaces; Transient heat conduction in solids with negligible internal resistance and with internal and surface resistance; Use of Heisler charts; Analytical and numerical solutions of conduction heat transfer problems. Heat transfer by the mechanism of radiation; Laws of radiation heat transfer; Blackbody radiation and radiative properties of surfaces; Angle factor; Net radiation interchange between two infinite parallel planes, concentric spheres and long cylinders; Simple enclosure problems; Radiation shield; Solar radiation and its prospects in Bangladesh.

**Text and Ref books:**

1. Principles of Heat Transfer – F. Kreith, (7<sup>th</sup> edition), M. S. Bohn, Publisher – Harper Int. Edition 1999.
2. Heat Transfer – J. P. Holman 7e, Publisher - Mc Graw-Hill Inter. Edition.
3. Heat Transfer: A Basic Approach – OZISIK, Publisher – McGraw-Hill Int. Edition 1985.

**ME 302 : Heat Transfer Sessional**

3/2 Contact Hour 0.75 Credit Hour

Sessional based on ME 301

**ME 303 : Convection, Boiling, Condensation and Mass Transfer**

3.00 Contact Hour 3.00 Credit Hour

Mechanism of convective heat transfer; General methods for estimation of convective heat transfer coefficient; Heat and momentum transfer associated with laminar and turbulent flow of fluids in forced convection; Fully developed flows and boundary layer developments in tubes/ducts over flat plates: empirical equations; Free convection from exterior surfaces of common geometrics, such as cylinder, plate, sphere etc.

Heat transfer mechanism with change of phase: condensation, types and analysis of film wise condensation on a vertical plate and horizontal cylinders; Boiling: mechanism and heat transfer correlations; Heat pipe.

Heat exchanger: basic types, LMTD, exchanger effectiveness-NTU relations, fouling and scaling of heat exchanger; Heat exchanger calculations; Techniques of heat transfer augmentation; Heat exchanger devices.

Mass Transfer: mechanism of mass transfer by diffusion convection and change of phase, simultaneous heat and mass transfer phenomena; Analogy between heat and mass transfer; Empirical equations.

**Text and Ref books:**

1. Principles of Heat Transfer – F. Kreith (7<sup>th</sup> edition), M. S. Bohn, Publisher – Harper Int. Edition 1999.
2. Heat Transfer – J. P. Holman 7e, Publisher - Mc Graw-Hill Inter. Edition.
3. Heat Transfer: A Basic Approach – OZISIK, Publisher – McGraw-Hill Int. Edition 1985.

**ME 304 : Heat and Mass Transfer Sessional**

3/2 Contact Hour 0.75 Credit Hour

Sessional based on ME 303.

**ME 321 : Fluid Mechanics-I**

3.00 Contact Hour 3.00 Credit Hour

Fundamental concept of fluid as a continuum; Fluid statics: basic hydrostatic equation, pressure variation in static incompressible and compressible fluids; Manometers; Forces on plane and curved surfaces; Buoyant force; Stability of floating and submerged bodies; Pressure distribution of a fluid in a rotating system.

Relation between system approach and control volume approach; Continuity, momentum and energy equations; Special forms of energy and momentum equations and their applications; Pressure, velocity and flow measurement devices.

Introduction to inviscid incompressible flow to include two dimensional basic flows.

**Text and Ref books:**

1. Fluid Mechanics with Engineering Applications – Robert L. Daugherty, Joseph B. Franzini, E. John Finnemore, Publisher – Mc Graw-Hill companies, 8<sup>th</sup> edition, 1985.
2. Introduction to Fluid Mechanics – Robert W. Fox, T. McDonald, Publisher – John Wiley and Sons, 2003.
3. Fluid Mechanics – Frank M. White, Publisher – Mc Graw-Hill, 1979, Engineering Fluid Mechanics – K. L. Kumar.

**ME 322 : Fluid Mechanics Sessional – I**

3/2 Contact Hour 0.75 Credit Hours

Experiments based on ME 321.

**ME 323 : Fluid Mechanics – II**

3.00 Contact Hour 3.00 Credit Hour

*Prereq.: ME 321*

Dimensional analysis and similitude; Fundamental relations of compressible flow; Speed of sound wave; Stagnation states for the flow of an ideal gas; Flow through converging-diverging nozzles; Normal shock; Real fluid flow; Frictional losses in pipes and fittings.

Introduction to boundary layer theory; Estimation of boundary layer and momentum thickness; Skin friction and drag of a flat plate.

Introduction to open channel flow; Best hydraulic channel cross-sections; Hydraulic jump; Specific energy; Critical depth.

**Text and Ref books:**

1. Fluid Mechanics with Engineering Applications – Robert L. Daugherty, Joseph B. Franzini, E. John Finnemore, Publisher – Mc Graw-Hill companies, 8<sup>th</sup> edition, 1985.
2. Introduction to Fluid Mechanics – Robert W. Fox, T. McDonald, Publisher – John Wiley and Sons, 2003.
3. Fluid Mechanics – Frank M. White, Publisher – Mc Graw-Hill, 1979, Engineering Fluid Mechanics – K. L. Kumar.

**ME 324 : Fluid Mechanics Sessional – II**

3/2 Contact Hour 0.75 Credit Hour

Experiments based on ME 323.

**ME 341 : Machine Design –I**

3.00 Contact Hour 3.00 Credit Hour

*Prereq.: ME 243*

Introduction to design; Stress analyses; Pressure vessels; Stresses in curved members; Deflection and stiffness considerations; Shock and impact; Column design; Statistical considerations; Types of fits; Design for static strength; Fracture mechanics in design; Design for fatigue strength; Design of screws, fasteners and connections; Keys and couplings, welded and brazed joints.

**Text and Ref books:**

1. Mechanical Engineering Design – Joseph Edward Shigley, Charles R. Mischke, Publisher – Mc Graw-Hill, 1988.
2. Mechanical Engineering Design – Joseph Edward Shigley, Publisher – Mc Graw-Hill Book Company, 1986.
3. Machine Design: An Integrated Approach – Robert L Norton, Publisher – Prentice Hall, 2<sup>nd</sup> edition, 2000.

**ME 342 : Machine Design Sessional – I**

3/2 Contact Hour 0.75 Credit Hour

Sessional based on ME 341.

**ME 343 : Machine Design-II**

3.00 Contact Hour 3.00 Credit Hour

*Prereq.: ME 243*

Mechanical springs; Rolling contact bearings; Lubrication and journal bearings; Spur, helical, worm and bevel gears; Shafts; Brakes, clutches and braking system; Rope, belt and chain drives; Design with composite materials.

**Text and Ref books:**

1. Mechanical Engineering Design – Joseph Edward Shigley, Charles R. Mischke , Publisher – Mc Graw-Hill, 1988.
2. Mechanical Engineering Design – Joseph Edward Shigley, Publisher – Mc Graw-Hill Book Company, 1986.
3. Machine Design: An Integrated Approach – Robert L Norton, Publisher – Prentice Hall, 2<sup>nd</sup> edition, 2000.

**ME 344 : Machine Design Sessional-II**

3/2 Contact Hour 0.75 Credit Hour

Submission of a Design Problem based on ME 341 & 343.

**ME 345 : Mechanics of Machinery**

4.00 Contact Hour 4.00 Credit Hour

*Prereq.: ME 241*

Mechanisms; Displacement, velocity and acceleration; Turning moment: inertia and kinetic energy of reciprocating and rotating parts; Static and dynamic balancing: reciprocating and rotating parts, multi-cylinder in-line and V-engines, radial engines, and opposed-piston engines; Balancing machines.

Undamped free vibrations with one and two degrees of freedom; Longitudinal, transverse and torsional vibrations; Torsional vibration with two and three rotor system. Damped free and forced vibrations with single and multi-degrees of freedom; Whirling of shafts and rotors; Vibration of geared systems; Vibration absorption, isolation and desolation, Vibration measuring instruments.

Study of cams and cam followers; Power transmission by belts, ropes and chains.

Study of gears and gears trains; Gyroscopes: principles and applications.

**Text and Ref books:**

1. Theory of Machines (S. I. Units) – R. S. Khurmi, J. K. Gupta, Publisher – Eurasia Publishing house (Pvt) Ltd.
2. Mechanics of Machines (Advanced theory and examples) 2<sup>nd</sup> edition (SI units) – John Hannah and R. C. Stephens.

**ME 346 : Mechanics of Machinery Sessional**

3.00 Contact Hour 1.50 Credit Hour

Laboratory procedures in balancing, analysis of cams and gears, vibration, moment of inertia of machine parts and gyroscopes.

**ME 361 : Instrumentation and Measurement**

3.00 Contact Hour 3.00 Credit Hour

Basic principles of measurements; Characterisation and behaviour of typical measuring systems; Different types of sensing elements; Measurement, transmission and recording methods; Measurements of displacement, pressure, temperature, heat flux, flow, motion and vibrations, force, torque, and strain; Data acquisition and processing.

**Text and Ref books:**

1. Experimental Methods for Engineers (6<sup>th</sup> edition) – J. P. Holman, Publisher – Mc Graw – Hill Inc.
2. Mechanical Measurements (5<sup>th</sup> edition) Thomas G. Beckwith, Roy D. Marangoni, John H. Lientard.

**ME 362 : Instrumentation and Measurement Sessional**

3/2 Contact Hour 0.75 Credit Hour

Sessional based on ME 361.

**ME 372 : Industrial Training ( Sessional)\*\***

04 Weeks duration 0.75 Credit Hour

Organization of the Industry and their duties, Function of different sections, Production process, Raw material used, Procurement and marketing, costing of the product, future planning and Problem facing by the Industry and their probable solution. Maintenance of machinery. Group presentation.

\*\* It will be conducted after the completion of Level-3, at any convenient time as can be arranged by the Department. Intensive training will be conducted in a particular industry prescribed by the department.

**ME 400 : Project and Thesis**

6.00 + 6.00 Contact Hour 3.00 + 3.00 Credit Hour

In this course, students are required to undertake a major project in engineering analysis, design, and development of research. The objective is to provide an opportunity to develop initiative, self reliance, creative ability and engineering judgment. The results must be submitted in a comprehensive report with appropriate drawings, charts, bibliography, etc. along with products if any. Use of locally available materials in manufacturing and feasibility study of local industrial units will be emphasized.

**ME 401 : Internal Combustion Engines**

3.00 Contact Hour 3.00 Credit Hour

*Prereq.: ME 201*

Introduction: basic engine types, their operation and testing; Idealised cycles and processes; Fuels: IC engine fuels, their properties and tests; Combustion: SI engine, CI engine and gas turbine; 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; Performance and design: performance of unsupercharged engines and supercharged engines, design considerations, application of principle of similitude in engine design.

Compressors and turbines: compression processes, volumetric efficiency, multistage compression, intercooling; Various types of compressors and gas turbines.

**Text and Ref books:**

1. The Internal combustion Engine, Theory and Practice. C. F. Taylor, Publisher – The MIT Press, 1985.
2. Engineering Fundamentals of Internal combustion Engine – W. W. Pulkrabek, Publisher – Prentice-Hall of India Pvt. Ltd –2002.
3. Internal Combustion Engines (3<sup>rd</sup> edition) – Edward F. Obert, Publisher – International Text book Co.

**ME 402 : Heat Engines Sessional**

3/2 Contact Hour 0.75 Credit Hour

Sessional based on ME 401.

**ME 403 : Power plant Engineering**

3.00 Contact Hour 3.00 Credit Hour

*Prereq.: ME 201*

Sources of energy; Production of power; Comparison of different types of power plants,; Survey of power plants in Bangladesh, health and safety standards, environmental, socio-economic perspective.

The variable load problem; Economic analysis of power plants; Theory of rates; Diesel-electric power plants: engine types and their performances, advantages, present trend.; Gas turbine power plants: cycle analysis; intercooling, regeneration and reheating, governing; Thermal power plants: fuels, 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. Hydro-electric power plants: site selection, components of the plant; Governing of water turbines; Nuclear power plant: types of reactors, layout of nuclear power plant, waste disposal.

**Text and Ref books:**

1. Power Plant Technology – M M. El-Wakil, Publisher – McGraw-Hill Book Company International, edition 1984.

**ME 404 : Steam Laboratories Sessional**

3/2 Contact Hour 0.75 Credit Hour

Sessional based on ME 403.

**ME 405 : Refrigeration and Building Mechanical Systems**

3.00 Contact Hour 3.00 Credit Hour

Concept of refrigeration and its applications; Different refrigeration methods; Analysis of vapour compression refrigeration, absorption refrigeration and air-cycle refrigeration systems; Refrigerants; Refrigeration equipment: compressors, condensers, evaporators, expansion devices, other control and safety devices; Multi-evaporator, multi-compressor systems; Low temperature refrigeration.

Concept of air conditioning and its uses; Cooling load calculation; Psychrometric analysis; Air conditioning systems; Air distribution systems; Duct and fan design methods; Air conditioning equipment; Application criteria; Control systems.

Fire Hazards and Noise Control: Fire fighting equipment; Vertical transportation, its system design, Escalators and moving ramps. Sound wave characteristics, absorption, transmission and control techniques in buildings.

Energy management: Types of energy usage, economic analysis, energy audit and net zero concept.

**Text and Ref books:**

1. Modern Refrigeration and Air-conditioning – A D. Althouse, C. H. Turnquist, A.F. Bracciano, Publisher – The Goodheant Wilcox Company, Inc. 1982.
2. Heating cooling of Building, Design for Efficiency – J. F. Kreidev, A. Raldl, Publisher – McGraw-Hill International Edition, 1994.

**ME 407 : Advanced Thermodynamics**

3.00 Contact Hour 3.00 Credit Hour

*Prereq.: ME 201*

Introduction to classical and statistical viewpoints in thermodynamics; Concepts of equilibrium, stability, reversibility, irreversibility and availability; Concepts of entropy; Principle of increase of entropy; Calculation of entropy changes; Statistical interpretation; Entropy of mixing; Absolute entropy; Entropy flow and entropy production; Properties of pure substances; Ideal gases; Ideal gas mixtures of constant composition; Ideal gas mixtures of variable compositions; Thermodynamic potentials: Helmholtz free energy function, Gibbs free energy function; Application of free energy functions; Transformations and thermodynamic potentials; Maxwell relations; Phase transitions; The Clausius-Clapeyron equation; Statistical mechanics: fundamental principles, energy states and levels;

Thermodynamic probability: Bose-Einstein statistics, Fermi-Dirac statistics; Thermodynamic properties of a system; special Topics: elastic systems, fuel cells, magnetic systems, thermo-electricity.

**Text and Ref books:**

1. Advanced thermodynamics for Engineers – K. Waxk, Publisher – McGraw-Hill International, Edition 1994.

**ME 409 : Renewable Energy**

3.00 Contact Hour 3.00 Credit Hour

Reserves of non-renewable fuels; Prospects of renewable energy, and its sources and pattern of usage; Characteristics of renewable sources: intermittent, low power density etc.; use of renewable in small-scale systems.

Current technology: wind wave, tidal, passive and active solar, biological and examples of devices; Energy management, interaction of non-technical requirements (social, economic, political, environment) in engineering design and innovation; Case-study.

**Text and Ref books:**

1. Energy Resources and Policy – R. C. Dorf, Publisher: Addison – Wesley Publishing Company 1978.
2. Alternative Energy Sources: a Strategy Planning guide – R. T. Sheahan, 1981.

**ME 411 : Combustion and Pollution**

3.00 Contact Hour 3.00 Credit Hour

Introduction to combustion; Heat of reaction, adiabatic flame temperature, heating values, chemical composition of products of combustion; Chemistry and kinetics of reactions; Reaction rate and flame propagation; Structure of laminar premixed flames; Explosions and fuel oxidation; Detonation; Combustion in internal and external combustion engines.

Production of pollutants in combustion systems; Emissions of green house gases, carbon monoxide, oxides of nitrogen and sulphur, and other pollutants.

Pollution control: post-engine exhaust treatment for emission control - thermal reactors, exhaust gas recirculation, catalysis; Pollution control by modification of combustion parameters; Other pollution control strategies.

**Text and Ref books:**

1. Combustion Engineering – G L Borman, K. W Ragland, Publisher – McGraw-Hill International, Editions 1998.

**ME 413 : 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 and techniques; Environmental impacts of energy conversion; Environmental economics and management; Case studies.

**Text and Ref books:**

1. Principles of Energy conversion – A W Culp, Publisher – McGraw-Hill Inc, 1999.

**ME 421 : Fluid Machinery**

3.00 Contact Hour 3.00 Credit Hour

*Prereq.: ME 323*

Types of fluid machinery; Rotodynamic and positive displacement machines; Velocity diagrams and Euler pump/turbine equation; Impulse and reaction turbines; Centrifugal and axial flow pumps; Deep well turbine pumps; Dimensional analysis applied to fluid machinery: specific speed, unit power, unit speed, unit discharge; Performance and characteristics of turbines and pumps; Design of pumps; Cavitation; Reciprocating pump, gear and screw pumps; Fans, blowers and compressors; Hydraulic transmission: fluid coupling and torque converter; System analysis, momentum and energy transfer, thermodynamic analysis, two dimensional analysis and selection of fluid machine.

**Text and Ref books:**

1. Fluid Flow Machines–Govinda Rao, Publisher-TATA MC GRAW HILL.
2. Thermodynamics of Turbomachinery – S. L, Dixon, Publisher – Pergaman Press.
3. Fluid Mechanics Vol.2 – Manohar & Krishnamachari, Publisher – Vikas Publishing.
4. Centrifugal and Other Rotodynamics Pumps – Addison, Publisher - Chapman & Hall.
5. Fluid Mechanics (2<sup>nd</sup> edition) – J. F. Douglas, J. M. Gaesirek, J. A. S. Waffield.
6. Hydraulic Machines – Dr. Md. Quamrul Islam, Publisher-BUET, Dhaka.

**ME 422 : Fluid Machinery Sessional**

3.00 Contact Hour 3.00 Credit Hour

Sessional based on ME 421.

**ME 423 : Fluid Engineering**

3.00 Contact Hour 3.00 Credit Hour

*Prereq.: ME 323*

Conservation of mass, momentum and energy; Derivation of Navier-Stoke's equations; Steady and unsteady flows; Flow in 2-D and axisymmetric ducts; Laminar jets; Stability of laminar flow; Orr-Sommerfield equation; Flow in branching pipe systems; Unsteady flow in pipes; Water hammer; Economics of pipe systems; Hydraulic machines: press, intensifier, ram, jigger, lift, jack.

**Text and Ref books:**

1. Foundation of Fluid Mechanics – S. W. Yuan, Publisher – Prentice – Hall of India Private Limited.

**ME 425 : Aerodynamics**

3.00 Contact Hour 3.00 Credit Hour

*Prereq.: ME 323*

Inviscid incompressible flow to include potential function, stream function, circulation and basic flows; Kutta-Joukowski theorem; Aerofoil theory and wing theory.

Drag, aircraft propulsion and propeller; Static performance problem; Special performance problem; Introduction to stability and control; Longitudinal stability and control; Lateral and directional stability and control.



**Text and Ref books:**

1. Aircraft Performance: Theory and Practice – M. E. Eshelby, M. Eshelby, Publisher – AIAA (American Institute of Aeronautic and Astronautics), 1991.
2. Fundamentals of Aerodynamics – John D. Anderson, Publisher – Mc Graw-Hill, 3<sup>rd</sup> edition, 2001.
3. Mechanics of Flight – Warren F. Phillips, Publisher Wiley, 2004.
4. Foundations of Aerodynamics: Bases of Aerodynamics Design – Arnold M. Kuethe, Chuess-yen chow, Publisher – Wiley, 5<sup>th</sup> edition, 1997.
5. Illustrated Guide to Aerodynamics – Hubert C. Smith, Publisher – Mc Graw-Hill Professional, 2<sup>nd</sup> edition, 1991.
6. Aerodynamics – L J Clancy, Publisher – Himalayan Books.
7. Aerodynamics – L. J. Clancy, Publisher – Himalayan Books.

**ME 427 : Applied Engineering Mathematics**

3.00 Contact Hour 3.00 Credit Hour

Non-linear differential equations: asymptotic method, perturbation method, Rayleigh-Ritz method, collocation method; Finite difference method; Finite element method; Boundary element method; Calculus of variations; Chaos theory.

**Text and Ref books:**

1. Applied Engineering Mathematics – Erwin Kreizig, Publisher – Wiley, 8<sup>th</sup> edition, 1998.
2. Mathematical methods for physicists and Engineers – Royal Eugune Collins, Publisher – Dover Publications, 2<sup>nd</sup> edition, 1998.
3. Engineering Mathematics – K. A. Stroud, Denter J. Booth, Publisher – Industrial press, 5<sup>th</sup> edition, 2001.

**ME 429 : Gas Dynamics**

3.00 Contact Hour 3.00 Credit Hour

*Prereq.: ME 323*

One dimensional flow with area change, friction and heat transfer; Flow in converging-diverging nozzles; Governing compressible flow equations; Transonic flow; Stationary, detached and moving shocks; Generation of shocks over wedge and its expansion; Supersonic and hypersonic flow; Shock interaction in supersonic flows.

**Text and Ref books:**

1. Gas Dynamics – Oswatitsch, Klaus.
2. Gas Dynamics – Zucrow, J. Maurice.

**ME 433 : Fluidics**

3.00 Contact Hour 3.00 Credit Hour

*Prereq.: ME 323*

Hydraulic and pneumatic components and systems; Servo control valves; Fluid transmission lines; Actuators; Fluids; Power supplies and fluid motors; Compressibility and leakage; System modelling, stability and compensation.

**Text and Ref books:**

1. Fluid Mechanics – F. M. White.
2. Fluid Mechanics – R. L. Daugherty.
3. Computational Fluid Dynamics – J. D. Anderson.

**ME 437 : Design of Fluid Machines**

3.00 Contact Hour 3.00 Credit Hour

*Prereq.: ME 323*

General theory of fluid machines; Similarity considerations to fluid machines; Pumps, fans, blowers and compressors: design considerations; Cascade fluid mechanics including effects of viscosity, compressibility and three dimensional flow; Performance characteristics and limitations; Cavitation and surging.

**Text and Ref books:**

1. Fluid Machine – Shames.

**ME 439 : Biomedical Fluid Mechanics**

3.00 Contact Hour 3.00 Credit Hour

*Prereq.: ME 323.*

Engineering approach to the analysis of circulatory and respiratory systems and to other problems in physiology involving fluid dynamics; Review of relevant anatomy and physiology emphasising qualitative consideration; Presentations and discussions; Simulation of physiological phenomena.

**ME 441 : Theory of Structures**

3.00 Contact Hour 3.00 Credit Hour

*Prereq.: ME 243*

Preliminaries; Elements stiffness matrices; Pin-joint structures; 2-D rigid-joint structures; Elastic plane element structures; Mixed element structures; Elastic stability of 2-D rigid-joint structures; Frequency of rigid-joint structures; Finite element method.

**Text and Ref books:**

1. Theory & Design of Structure – E. S. Andrews.
2. Structural Design By Computer – E. W. Wright.
3. Structural Design with Plastic – B. S. Benjamin.

**ME 445 : Noise and Vibration**

3.00 Contact Hour 3.00 Credit Hour

Sound waves; Sound sources; Sound transmission through walls and structures; Acoustics of large and small rooms; Mechanism of sound absorption; Design of silencers.

Vibration isolation, machine foundation design; Vibration absorption; Random vibration; Beam and plate vibrations.

**Text and Ref books:**

1. Fundamentals of Noise and Vibration – F. J. Fahy, J. G. Walker, Publisher – Spon Press; 1998.
2. Active control of Noise and Vibration – Colin Snyder Hansen – C. H. Hansen, Scott Snyder, Publisher – Spon Press, 1<sup>st</sup> edition, 1996.

**ME 447 : Robotics**

3.00 Contact Hour 3.00 Credit Hour

Introduction to robotics; Definitions; Plane, rotational and spatial motion with applications to manipulators; Geometric configurations: structural elements, linkages, arms and gripper; Kinematics of manipulators; Motion characteristics, trajectories, dynamics and control of manipulators; Actuators and sensors for manipulators; Application of industrial robots and programming; Teleoperators, mobile robots and automated guided vehicles; Special purpose robots.

**Text and Ref books:**

1. Introduction to Robotics Analysis System Application – S. B. Niku.
2. Robotics Engineering – R. D. Klefter & Others.
3. Robotics – J. J. Craig.

**ME 449 : Composite Materials**

3.00 Contact Hour 3.00 Credit Hour

Fibrous composites; Reinforcement types; Ply stiffness; Ply strength; Failure criteria; Layered laminate; Laminate stiffness; Laminate strength; Residual stress; Thin-walled composite sections; Interlaminar stresses; Hole in laminates; Buckling of laminates.

**Text and Ref books:**

1. Mechanics of composite Materials – Autar K. Kaw, Publisher – CRC Press, 1997.
2. Mechanics of composite Materials – Robert M. Jones, Publisher – John Benjamins Publishing Co, 1975.
3. Introduction to Composite Materials – Stephen W. Tsai, Publisher – CRC press, 1980.

**ME 451 : Aircraft and Aero-engine Structure**

3.00 Contact Hour 3.00 Credit Hour

Aircraft structure: introduction, fuselage, wing, control surfaces and landing gear; Structural elements of wing and fuselage; Constructional features of wing.

Helicopter structure: introduction, main rotor, tail rotor, free wheel unit; power transmission; Main gearbox.

Aero-engine structure: Types of aero-engine, intake, compressor, combustion chamber, turbine, exhaust, after burner; Selection of materials for aircraft and aero-engine.

**Text and Ref books:**

1. Airframe and Power Plant – C A Zweng, Publisher - Galotia Publications.
2. Janes all the world's Aircraft Taylor WR (2002-03) – Barr and Isroud.
3. Aircraft Structure – David & Perez, Publisher – Mc Graw-Hill.
4. Introduction to Aerospace structural Analysis–David H Allen, Publisher–Weley & Sons.
5. Jet Aircraft Power System (3<sup>rd</sup> edition) – Jack VC, Publisher – Mc Graw- Hill.
6. Aircraft gas turbine Engine Technology – I E Treager, Publisher – Purdue University.
7. Engine the Search for Power – John Day, Publisher – Hamlyn London.
8. AP - 3456B

**ME 453 : Applied Aerodynamics**

3.00 Contact Hour 3.00 Credit Hour

**Aircraft :** Basic structure of ac. Basic forces act on ac.

**Atmosphere :** Temperature changes in atmosphere; Effect of temperature, pressure and density with change of altitude; International standard atmosphere; Local & free stream characteristics; Atmospheric layers; Air Speed & Ground speed.

**Air Flow :** Dimensional analysis; Reynolds Number; Wind tunnel and scale effect; Rayleigh's formula, Equation of Continuity, Bernoulli's theorem, venturi tube; Boundary layer: Laminar and turbulent flow; Circulation and Generation of lift; Static and Dynamic Pressure; Air Operated Instruments : Pilot Static tube; Principle of altimeter; Measurement of Air Speed; IAS, RAS, EAS and TAS; Position Error.

**Aerofoil Terminology :** Different Shapes of aerofoils, Definitions : Chord, Camber, Angle of Attack, Aspect Ratio, Taper wing; Lift; Air flow and pressure distribution over aerofoil, Pitching moment; Centre of pressure and Aerodynamic centre; Drag; Types of Drag - Form Drag, Skin Friction drag, Induced Drag; Aerofoil characteristics : Lift Curve, Drag Curve, Lift/Drag ratio curve; Aircraft Controls and high lift devices.

**Performance :** Minimum drag curves; Power Curves; Ceiling; Flight envelope, Stability and control; Static and dynamic stability.

**Maneuvers :** Different types of wings and their effect ; Effect of Tail plane; Take off and Landing; Climbing and Gliding; Turning, loops, spins, inverted flying;

**Transonic Speeds :** Introduction to Transonic, supersonic and Hypersonic speed; Propagation of wave; Mack cone; Formation of shock wave.

**Text and Ref books:**

1. Theoretical Aerodynamics – Thomson L MM, Publisher – Mac Millan.
2. Mechanics of flight – Kermode, Publisher - A C Wheeler and Co.
3. The Aerodynamic design of Aircraft – D Kucheman, Publisher – Pergamon Press.
4. Aerodynamics – L J Chancy, Longnan.
5. Higher approximation in Aerodynamic Theory – M J Light Hill, Publisher – Poinaton University.
6. High Speed Wing theory – R. T Jones, Publisher – Princeton University.
7. AP - 3456A

**ME 455 : Aircraft stability and control and Aircraft systems**

3.00 Contact Hour 3.00 Credit Hour

Systematic account of Aircraft Stability and Control. This includes the Static Longitudinal, Directional and Lateral stability with respect to the aircraft axis systems. Effect of various wings design and secondary control surfaces.

The Aircraft system includes; A/C System in general, Hydraulic system, Pneumatic system, Flight control system, Landing gears system, fuel system, Cockpit pressurisation & air-conditioning system, Speed brake and thrust reversal, anti-icing system, electrical system, flight instruments, life saving equipment.

**Text and Ref books:**

1. Aircraft dynamic stability and response – A W Babister, Publisher – Pergamon Press.
2. Airplane Performance stability and control – CD Perking.
3. Aero Structures – N I Hoff, Publisher – Pergamon Press.
4. Aircraft design a conceptual Approach – Daniel. P. Paymek, AIAA.

**ME 463 : Petroleum Engineering**

3.00 Contact Hour 3.00 Credit Hour

An overview of hydrocarbon reserves in Bangladesh; Classification of rocks and hydrocarbon deposits and their genesis; Geophysical exploration of oil and gas; Physical properties and characteristics of reservoir rocks; Origin, accumulation, composition and behaviour of hydrocarbon reserves; Analysis and prediction of reservoir performance.

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.

**Text and Ref books:**

1. Introduction to Petroleum, Geology and Drilling – Md. Abdur Razzaq Akanda, Md. Quamrul Islam Publisher – BUET.
2. Fundamentals of Petroleum Industry – Robert O. Anderson, Publisher – University of Oklahome press, 1985.
3. Nontechnical Guide to Petroleum, Geology, Exploration, Drilling and Production – Norman J. Hyne, Publisher – Pennwell Books, 2<sup>nd</sup> edition, 2001.

**ME 465 : Applied Statistics**

3.00 Contact Hour 3.00 Credit Hour

Simple regression and correlations, multiple regression; Tests of significance; Analysis of variance; Experimental design; Factor analysis; Statistical packages.

**Text and Ref books:**

1. Probability and Its Applications – H. C. Saxena.
2. Statistics and Probability in Modern Life – Joseph Newman.
3. Business Statistics – M. P. Gupta and S. P. Gupta.
4. Statistics and Probability – Spiegel (Schaum Series).
5. Elementary Statics – H. C. Saxena.

**ME 467 : Automobile Engineering**

3.00 Contact Hour 3.00 Credit Hour

Introduction to road vehicles; Components of automobile; Automotive engines: types and construction; Valve events; Knock, preignition and postignition; Friction in engines and automobile components; Lubrication systems; Automotive fuel system for SI and CI engines; Ignition system; Alternative fuels and alternative types of engines; Engine cooling and exhaust systems.

Vehicle performance: linear and angular inertia, braking effects, gyroscopic effects and reactions, tractive effort and vehicle vibration; Resistance to vehicle motion: gradient resistance, aerodynamic resistance, rolling and frictional resistance; Development strategies for minimum resistance.

Automotive transmission systems and power train: clutch, gear, differential and final drives.

Automotive safety: brakes; Reduction of injuries; Automotive body: materials and vehicle shape; Springs and suspension; Steering system.

Electrical systems: cranking motor, alternator and lighting; Electronic control systems and indicators.

Environmental considerations: vehicle emissions and control strategies; Noise pollution and control; Vehicle fuel economy.

Testing of vehicle; Motor vehicle regulations.

**Text and Ref books:**

1. Mechanic of Automobiles – H. E. Barnacle.
2. Advanced Vehicle Technology – H. Heisler.
3. Automotive Mechanics – W. H. Crouse.

**ME 469 : Nuclear Engineering**

3.00 Contact Hour 3.00 Credit Hour

World energy resources; Importance of fission energy; Atomic structure; Nuclear energy and nuclear forces; Nuclear fission and fusion processes; Nuclear fission reactors; Reactors controls; Reactor coolants; Process waste disposal; Nuclear power reactor systems.

**ME 471 : Bio-Engineering**

3.00 Contact Hour 3.00 Credit Hour

Introduction to human musculoskeletal system; Biomechanics of human movement: applications of engineering mechanics to the movements of muscles, bones and skeletal joints; Material and structural characteristics of bones, ligaments, muscle/tendons and joints - alternative materials.

Introduction to biomechanical fluid mechanics; Engineering approach to the function of circulatory and respiratory systems involving fluid dynamics.

Introduction to biomedical instrumentation; Ultrasound, x-ray, laser, microwave and ultra-violet rays - physics and technology of generation – their use in diagnostic, therapeutic, and processing applications in medicine industry.

**Text and Ref books:**

1. Review of Medical Physiology – W. F. Ganong.
2. Introduction to Biomedical Equipment Technology – J. T Carr.
3. X-Ray Repair – J. J. Parichello.
4. Biomechanics of Mascalco - Skeletal System – B. M. Nigg.

**ME 473 : Plastics Process Technology**

3.00 Contact Hour 3.00 Credit Hour

Introduction; Properties; Testing of properties; Identification of common plastics; Flow behavior; Processing parameters; Degradation; Fillers; Additives; Mixing and compounding; Mills: internal and continuous; Processing of plastic materials: extrusion, injection moulding, thermoforming, blow moulding, film blowing, compression moulding, and transfer moulding; Reinforcement of plastics; Calendering and laminating; Instrumentation and control.

**Text and Ref books:**

1. Principles of Polymer Engineering – N. G. McCrum, P. C. Buckley, C. B Bucknall.
2. Plastic Process Engineering – James L, Throne.

**ME 291 : Metallic Materials**

3.00 Contact Hour 3.00 Credit Hour

Concept of malleability, ductility, toughness, fatigue resistance and other properties; Mechanical and non-destructive tests of metals; Crystal structure of metals, Pig iron: production and uses; Cast iron: production, types, uses and effects of impurities; Steels: Bessemer and open-hearth steels, production and uses; Plain carbon and different types of alloy steels; Bearing metals; Light alloys; Common metals and their alloys; Phase diagram including the Fe-FeC equilibrium diagram; Types of heat treatment; Case carburizing and nitriding.

**Text and Ref books:**

1. Chemistry of Engineering Materials (4<sup>th</sup> edition) – Robert B. Leighou, Publisher – Mc Graw-Hill Inc.
2. Introduction to Physical Metallurgy (2<sup>nd</sup> edition) Sidney H Avner, Publisher –Tata Mc Graw – Hill Edition.
3. Engineering Metallurgy (Part I & II) (6<sup>th</sup> edition) – Raymond A. Huggins, Publisher – Viva Books Private Ltd.
4. Materials Science and Engineering: An Introduction – W D Callister, Jr. Publisher – John Wiley and Sons, Inc (4<sup>th</sup> edition) 1997.
5. Introduction to Materials Science for Engineering – Shackelford.
6. Introduction to Physical Metallurgy – S F Avner, Publisher – Mc Graw Hill (2<sup>nd</sup> edition).
7. Physical Metallurgy for Engineers – D S Clarke and W B Verney.

**ME 292 : Metallic Materials Sessional**

3/2 Contact Hour 0.75 Credit Hour

Experiments based ME 291.

**ME 331 : Production Process**

4.00 Contact Hour 4.00 Credit Hour

Selection of machining.

Casting: sand, die, centrifugal and other types of casting; Casting design and casting defects; Chipless metal forming process; Different types of hot and cold working processes; Welding: arc, gas, TIG, MIG, resistance, thermit, and special types; Brazing and soldering.

Tool geometry and chip formation processes.

Metal removing processes: turning, drilling, shaping, planing, milling, broaching, grinding, precision and non-precision finishing processes.

Plastic, ceramic and glass product manufacturing processes.

**Text and Ref books:**

1. Manufacturing Engineering and Technology (4<sup>th</sup> edition) – Serope Kalpakjiann Steven R. Schmid, Publisher – Prentice Hall, 4<sup>th</sup> edition, 2004.
2. Manufacturing Processes and Materials for Engineers – Doyle Morris.
3. Introduction to Manufacturing Process – John A. Schey, Publisher – Mc Graw-Hill, 1999.

**ME 332 : Production Process Sessional**

3/2 Contact Hour 0.75 Credit Hour

Experiments based on ME 331.

**ME 381 : Measurement and Quality Control**

3.00 Contact Hour 3.00 Credit Hour

Organisation of inspection; Kinds of inspection; Standards of length; Scope and techniques for maintaining tolerances; Grades of manufacturing accuracy; Assembly-selective and interchangeable assembly; Gauging and limit gauges; Taylor's principles on limit gauges; Thread measurement and thread gauges; Abbey's principle; Measuring tools for angles and tapers; Instruments for checking straightness and flatness and for alignment test; Gear measurement; Measurement of surface finish, and surface roughness; Electrical and electronic measurements; Nondestructive test.

Frequency distribution, measures of central tendency and dispersion; Concept of probability, conditional probability and Bayes' theorem; Probability distributions, moment and moment generating function; Sampling theory; Estimation; Hypothesis testing; Acceptance sampling plans - single, double, sequential, rectifying inspection plans; Control charts, X, R and C charts; Regression analysis; Analysis of variance; Concept of quality circle; TQM and TQC.

**Text and Ref books:**

1. Quality Planning and Analysis – J. M. Juran & F. M. Gryna.
2. Quality Control By Statistical Methods – Schrock, M. Edward.

**ME 382 : Measurement and Quality Control Sessional**

3/2 Contact Hour 0.75 Credit Hour

Experiments based on ME 381.

**ME 431 : Machine Tools**

3.00 Contact Hour 3.00 Credit Hour

Mechanical, electrical, hydraulic and pneumatic drives in machine tools; Bearings, slide ways, structure and control of machine tools; Detailed case study of engine lathe, turret lathe, milling machine, grinding machine, and gear shaping machine.

Installation and acceptance tests of machine tools.

Locating principles and locators, clamps, dies, jigs/fixtures.

**Text and Ref books:**

1. Machine Tools – N. Chernov, Publisher – Mir Publishers, Moscow.
2. Machine Tool Design (1, 2, 3, & 4 Volumes) – by Acherlcan.
3. Elements of Machine Tools – M Anwarul Azim, Dr Ing (Germany), Published by BUET, Dhaka.

**ME 432 : Machine Tools Sessional**

3/2 Contact Hour 0.75 Credit Hour

Experiments based on ME 431.



**ME 477 : Metal Cutting Process**

3.00 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.

**Text and Ref books:**

1. Application of Metal Cutting Theory – Fryderyk E. Gorczyca, Publisher – Industrial press, 1987.
2. Machine Tools – Chernov.
3. Machine Tools Design – N. Acharkhan.
4. Machine Tool Practices – Richard R. Kibbe, Roland O. Meyer, Warren T. White, John E. Neely, Publisher – Prentice Hall, 7<sup>th</sup> edition, 2001.
5. Machine Tool operations – Steve F. Krar, Joseph V. St, Amand, J. William Oswald, Publisher – Mc Graw-Hill, 1<sup>st</sup> edition, 1983.

**ME 475 : Modern Manufacturing Technology**

3.00 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.

**Text and Ref books:**

1. Manufacturing Engineering and Technology – Serope kalpakjian, Steven R. Sahmid, Publisher – Prentice Hall, 4<sup>th</sup> edition, 2000.
2. Machine Tool Technology and Manufacturing Processes -C. Thomas olivo, Publisher – Delmar Thomson Learning, 1987.

**ME 479 : CAD/CAM**

3.00 Contact Hour 3.00 Credit Hour

CAD: fundamental concepts, application, benefits, hardware and software; Types of CAD systems; Common 2D CAD software features; Basic 3D CAD features.

CAM: fundamental concepts; Trend of development of numerical control (NC); Principles of NC; Types of NC systems; Types of NC machines; CNC (manual) part programming; CNC part programming using CAM softwares; Interfacing CAM software with CNC machines; Computer aided machining.

**Text and Ref books:**

1. CAD/CAM – Theory and Practice – Ibrahim Zeid.
2. CAD/CAM – Principles, Practice and Manufacture Management – Chris McMahan, Jimmie Browne.
3. Numerical Control and Computer Aided Manufacturing – T. K. Kuudra, P.N. Raw, N. K. Tewari.

**ME 481 : Industrial Management**

4.00 Contact Hour 4.00 Credit Hour

Organisation and management: evolution, management functions, and organisation structure; Development of organisation theory; Study of various types of organisation and management information systems; Concepts and scope of application.

Cost management elements of cost of products, cost centres and allocation of overhead costs; Management accounting: marginal costing, standard costing, cost planning and control, budget and budgetary control; Development and planning process; Annual development plan; National budget.

Financial management: objectives, strategy, financing, performance analysis of enterprises, investment appraisal, criteria of investment.

Personnel management: importance, scope, need hierarchy, motivation; Defense mechanism; Productivity and satisfaction; Leadership; Group dynamics; Job evaluation and merit rating; Personnel development - hiring, training, wage systems.

Marketing management: marketing concept, marketing organization; Industrial and consumer selling; Channel decisions; Advertising decisions; New product strategy.

Technology management.

Case study.

**Text and Ref books:**

1. Management – Jams A. F. Stoner, R. Edward Freeman, Daniel R. Gilbert,
2. Management – Stephen P. Rubbins, Mar Conlter, Robin Stuart kotze.

**ME 483 : Production Planning and Control**

3.00 Contact Hour 3.00 Credit Hour

Elements of production planning and control; Types of production system.

Forecasting methods and their application; Aggregate planning; Master production scheduling; MRP; Coding and standardization; Capacity planning; Inventory management - ABC analysis; Production scheduling techniques - CPM and PERT; Line balancing; Capacity planning.

Plant location and layout; Work study and method study; Plant performance measurement; Introduction to product development and design.

Computers in production planning and control; MRPII and JIT.

**Text and Ref books:**

1. Operations Management – Strategy and Analysis, Lee J. Krajewski, Larry P. Ritzman.
2. Production and Operations Management – A Life Cycle Approach, Richard B. Chose, Nicholes J. Aquilano.

**ME 491 : Operations Research**

3.00 Contact Hour 3.00 Credit Hour

Introduction; Linear programming - simplex and transportation model; Network analysis; Dynamic programming; Introduction to simple queuing models; Introduction to probabilistic inventory models; Game and decision theory; Simulation; Integer programming; Scheduling; Reliability.

**Text and Ref books:**

1. Operation Research an Introduction (4<sup>th</sup> edition) Hamdy A. Taha, Publisher – Macmillan Publishing Company, New York.
2. Introduction to Operation Research (3<sup>rd</sup> edition) Hillier and Lieberman, Holden – Day, Inc.

**ME 493 : Material Handling**

3.00 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.

**Text and Ref books:**

1. Material Handling Systems Design – J. M. Apple.

**ME 495 : Mechatronics**

3.00 Contact Hour 3.00 Credit Hour

Introduction; System concept and their representation by differential equations and Laplace transforms; Block diagrams and transfer functions; Mechanical, electrical, fluid and thermal system control components; System response, control action and system types, Frequency response; System analysis; System compensation; Analogues of control systems; Hydraulic and pneumatic control systems; Elements of electromechanical controls; linear control design process; Software based tools; Virtual instrumentation; CAD; CAM; Computer integrated systems; Computer interfacing; Manipulators; Actuator types; Sensors and vision systems; Basics of AI and future trends.

**Text and Ref books:**

1. Introduction to Automatic Controls (2<sup>nd</sup> edition) – Howard L. Harrison, John G. Bollinger, Publisher – International Text Book Company, Scranton, Pennsylvania.
2. Control System Engineering – N. S. Nise
3. Mechatronics: Electronic Control Systems in Mechanical Engineering – W. Bolton, William Bolton, Publisher – Prentice Hall, 2<sup>nd</sup> edition, 1998,
4. Mechatronics: Mechanical System Interfacing – David M. Auslander, Carl J. Kempf, Publisher – Prentice Hall, 1<sup>st</sup> edition, 1995.

### **ME 415: Hydrostatic and Stability of Ships and Marine Vehicles**

3.00 Contact Hour 3.00 Credit Hour

Prerequisite : ME 321 & ME 323

Hull form definition of ships and ocean structures. Lightweight, deadweight, capacity and tonnage measurement, Hydrostatic calculations. Initial stability, free surface effects, stability at large angles, intact stability computations, damages stability and its calculations by lost buoyancy and added weight method, Inclining experiment. International Maritime Organization (IMO) stability criteria, wind hell criteria, subdivision and floodable length calculations. Subdivision indices. Launching calculations.

#### **Text and Ref Books:**

1. Basic Ship Theory Volume – I (3<sup>rd</sup> edition) – K.J. Rawson & E.C Tupper.
2. Principles of Naval Architecture (Revised edition), Publisher – The Society of Naval Architecture and Marine Engineers.
3. Know Your Own Ship (28<sup>th</sup> edition) – Walton and Baxter, Publisher – Charles Griffin and Company Ltd.
4. Introduction to Naval Architecture – Thomas C. Gillmer and Bruce Johnson, Publisher – E& F. N Spon Ltd, 11 Ftter Lane, London.

### **ME 417 : Shipbuilding Technology**

3.00 Contact Hour 3.00 Credit Hour

Development of ship welding, Different types of welding and their equipment. Welding methods in brief: MMAW, GMAW, SAW, Electroslag welding, TIG, Types of welding joints, Welding symbols, Welding sequence in shipbuilding, Common defects in ship welding: welding distortion monitoring and control, inspection and testing of welded specimen. Methods and principles of cutting, cutting equipment. Steel surface preparation – shot blasting, acid picking etc and painting. Introduction to the rules of Classification Society.

#### **Text and Ref books:**

1. Ship Design and Construction (1980 edition), Editor – Robert Taggart, Publisher – The society of Naval Architects and Marine Engineers, New York.
2. Ship Construction (Second edition) – D. J. Eyres, Heinemann, London.

### **ME 419: Resistance and Propulsion of Ships**

3.00 Contact Hour 3.00 Credit Hour

Prerequisite: ME 323

Phenomena resisting the motion of ships, Resistance due to friction, wave making, form, appendage, wing and waves squat, blockage and shallow water effects. Estimation of powering using methodical series and statistical methods. Advantageous effects of hull form changes – bulbous bows. Asymmetric sterns and optimum trim for ships in ballast.

Screw propeller geometry, Momentum and blade element theories. Propellers in open water, propeller coefficients and design charts. Hull propeller interaction- wake, thrust deduction and relative rotative efficiency. Propeller cavitations. Propeller blade strength. Screw design according to circulation theory for uniform and non-uniform wake. Speed trials and service performance analysis.

**Text and Ref books:**

1. Basic Ship Theory Vol-2 (3<sup>rd</sup> edition) – K. J. Rawson & E. C. Tupper, Publisher – Longman Group Limited, Longman House, Burnt Hill, Harlow, Essex CM 20 2JE, England.
2. Principles of Naval Architecture (Revised edition) – Joh P. Comstock, Publisher – The Society of Naval Architects and Marine Engineers.
3. Resistance and Propulsion of Ships – S V A. A. Harvald, Publisher – John Wiley & Sons, New York and Singapore.

**ME 457: Ship Structure**

3.00 Contact Hour 3.00 Credit Hour

Prerequisite: ME 243

Development of Ships structure, Details of structural members, Forces on the ship, Ship strength calculation, longitudinal and transverse strength of ship, Dynamic effects. Structural discontinuities, stress concentration, superstructure theory, Plate and shell analyses: grillages, bucking of plates, Composite construction. Introduction to Finite Element Methods (FEM).

**Text and Ref books:**

1. Strength of Ships Structure – I. W. Muckle, Publisher – Edward Arnold Ltd, London.
2. Principles of Naval Architecture (Revised edition) – John P. Comstock, Publisher – The Society of Naval Architects and Marine Engineers.
3. Ship Design and Construction (1980 Edition) – Robert Taggart, Publisher – The Society of Naval Architects and Marine Engineers.

**Industrial Tours\***

3 weeks (maximum)

Visit to prescribed industries selected by the department.

**NOTE:**

- \* Industrial tours will be considered a co-curricular activity. It may be conducted at any convenient time as can be arranged by the Department after the completion of Level 1.

**CHAPTER 6****6.0 Courses Offered by ME Department to Students of other departments**

<b>Course No</b>	<b>Course Name</b>	<b>Level-Term</b>	<b>Contact Hours</b>	<b>Credit Hours</b>
<b>ME 181</b>	<b>Basic Mechanical Engineering</b>	<b>1-II CSE</b>	<b>2.0</b>	<b>2.00</b>
<b>ME 182</b>	<b>Basic Mechanical Engineering Sessional</b>	<b>1-II CSE</b>	<b>3.0/2</b>	<b>0.75</b>
<b>ME 263</b>	<b>Fundamentals of Mechanical Engineering</b>	<b>2-II EECE</b>	<b>3.0</b>	<b>3.00</b>
<b>ME 264</b>	<b>Fundamentals of Mechanical Engineering Sessional</b>	<b>2-II EECE</b>	<b>3.0</b>	<b>1.50</b>
<b>ME 393</b>	<b>Industrial Management</b>	<b>3-II EECE</b>	<b>3.0</b>	<b>3.00</b>
<b>ME 493</b>	<b>Industrial Management</b>	<b>4-II CSE</b>	<b>2.0</b>	<b>2.00</b>

## CHAPTER 7

### 7.0 DETAIL OUTLINE OF UNDERGRADUATE COURSES OFFERED BY ME DEPARTMENT TO OTHER STUDENTS

#### **ME-181 Basic Mechanical Engineering**

2.00 Contact Hour, 2.00 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-182 Basic Mechanical Engineering Sessional**

3.00/2 Contact Hour 0.75 Credit Hour

Laboratory works based on ME-181.

#### **ME 263 : Fundamentals of Mechanical Engineering**

3.00 Contact Hour 3.00 Credit Hour

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 and air conditioning: Their applications; 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.

#### **Text and Ref books:**

1. Heat Engines – D. A. Low.
2. Principles of Energy Conversion – A W Culp, Publisher – Mc Graw-Hill Senes 1999.
3. Basic Mechanical Engineering – R. K. Rajput, Publisher – Laxmi Publishers (P) Ltd, 1999.
4. A Text Book of Thermal Engineering – R. S. Khurmi & J. K. Gupta.
5. Basic Mechanical Engineering – R K Rajput, Engineering Fluid Mechanics – K. L. Kumar.

#### **ME 264 : Fundamentals of Mechanical Engineering Sessional**

3.00 Contact Hour 1.50 Credit Hour

Sessional based on ME 263.

**ME 393 : Industrial Management**

3.00 Contact Hour 3.00 Credit Hour

Management Functions and Organization: Evolution; Management functions: organization, theory and structure, span of control, authority delegation, manpower planning. Personnel Management: Importance, need hierarchy, motivation, leadership, wage incentives, performance appraisal, participative management. Operation Management: Production planning and control (PPC) functions, quantitative methods applied in production, quality management, location and layout planning, safety and loss management. Cost and financial Management: Elements of cost products, cost analysis, investment analysis, cost benefit analysis, risk analysis. Management Accounting: Cost planning and control, budget and budgetary control. Marketing Management: Concepts, strategy, sales promotion, patent laws. Technology Management: Management of innovation and changes, technology life cycle.

Case studies.

**ME 493 : Industrial Management**

2.00 Contact Hour 2.00 Credit Hour

Management Functions and Organization: Evolution; Management functions: organization, theory and structure, span of control, authority delegation, manpower planning. Personnel Management: Importance, need hierarchy, motivation, leadership, wage incentives, performance appraisal, participative management. Operation Management: Production planning and control (PPC) functions, quantitative methods applied in production, quality management, location and layout planning, safety and loss management. Cost and financial Management: Elements of cost products, cost analysis, investment analysis, cost benefit analysis, risk analysis. Management Accounting: Cost planning and control, budget and budgetary control. Marketing Management: Concepts, strategy, sales promotion, patent laws. Technology Management: Management of innovation and changes, technology life cycle.

Case studies.

**Text and Ref books:**

1. Human Resources and Personnel Management – William B. Werther, Jr., Keith Davis (5<sup>th</sup> edition), Publisher – Mc Graw-Hill, Inc.
2. Marketing Management (The Millennium edition) – Philip Kotler, Publisher – Prentice – Hall of India, Private Limited.
3. Personnel Management – Edwin B. Flippo, Publisher – Mc Graw-Hill Book Company (6<sup>th</sup> edition).



**CHAPTER 8****8.1 Prerequisite Courses for ME Students for Courses Offered by Other Departments**

<b>Course No</b>	<b>Course Title</b>	<b>Prerequisite Course No</b>
Hum 227	Industrial Sociology	Hum 201

**NOTE:** Satisfactory class performance of any prerequisite will fulfill its condition as prerequisite.

## CHAPTER 9

## 9.0 DETAIL OUTLINE OF UNDERGRADUATE COURSES OFFERED BY OTHER DEPARTMENTS TO ME STUDENTS

**Phy 102 : Physics Sessional**

3.00 Contact Hour 1.50 Credit Hours

Sessional based on Phy 105 and Phy 107.

**PHY-105: Structure of matter, Electricity & Magnetism and Modern physics.**

3.00 Contact Hour 3.00 Credit Hour

**Detail syllabus****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, radio active 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,

**References:**

1. "Elementary Solid state physics" by -M. Ali Omar, person education.
2. "Introduction Solid state physics" by -C.Kittle; John Wilry & sons Inc.
3. "Concept of Modern Physics" by - Arther Beiser; McGraw Hill
4. "Perspective of Modern Physics" by - Arther Beiser; McGraw Hill
5. "Modern Physics "by -B.L Theraja.
6. "Physics part-II by - Resnick and Halliday
7. "Crystallography applied to solid state physics" by -A.R. Verma

**PHY-107: Waves and Oscillation, Geometric optics and Wave mechanics.**

3.00 Contact Hour 3.00 Credit Hour

**Detail Syllabus****Waves and Oscillation**

Differential equation of Simple harmonic oscillator, total energy and average energy, Combination of Simple harmonic oscillations, Lissajous figures; spring mass system, Calculation of time period of torsional pendulum; damped oscillations, determination of damping co-efficient forced oscillation, resonance, two body oscillations, reduced mass , differential equation of a progressive wave, power and intensity of wave motion, stationary wave, phase velocity and group velocity, Architectural acoustics, reverberation and Sabine's formula

**Geometrical optics: *Combination of lenses:*** equivalent lens and equivalent focal length, cardinal points of a lens, power of a lens. Defects of images: spherical aberration. Astigmatism, coma, distortion, curvature and chromatic aberration. Optical instruments, Compound microscope, polarizing microscope, resolving power microscope, camera and photographic techniques.

**Wave mechanics :** Principle of statistical physics: Probabilities, classical statistics, quantum statistics: Bose-Einstein statistics, Fermi-Dirac statistics and their applications. Fundamental postulates of wave mechanics, time dependent schrodinger's equation, steady state schrodinger's equation for one electron atom and its solution.

**References:**

1. "A Text Book of Optics" by – Brijlal and Subramannyam
2. "A Text Book of Sound by - Brijlal and Subramannyam
3. "Waves and oscillation" by - Brijlal and Subramannyam
4. "Physics part-I by - Resnick and Haliday
5. "Physics part-II by - Resnick and Haliday
6. "Fundamentals of Physics" by - Haliday, Resnick and Walker
7. "Concept of Modern Physics" by - Arther Beiser; McGraw Hill
8. "Perspective of Modern Physics" by - Arther Beiser; McGraw Hill

**Chem 101 : Chemistry - 1**

3.00 Contact Hour 3.00 Credit Hour

**SECTION - A**

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.

**SECTION - B**

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.

**CHEM 114 Inorganic Quantitative Analysis (Sessional)**

Credit Hr-1.50, Contract Hr-3.00

Volumetric analysis: Acid-base titration, Oxidation-reduction titration: Determination of Cu, Fe and Ca content volumetrically.

**Chem 141 : Chemistry of Engineering Materials**

3.00 Contact Hour 3.00 Credit Hour

**SECTION - A**

**Glass:** raw materials, classification, manufacturing processes and application of glasses in chemical industries. **Ceramics:** fundamental of ceramic industry, raw materials, property, manufacture and classification of ceramic products. **Refractory materials:** raw materials, properties, manufacture and classification of refractory. **Corrosion:** nature, form and types of corrosion, electrochemical mechanism and prevention of corrosion. **Corrosion in boiler and boiler feed water treatment, Paints, varnishes and metallic coating:** composition and application of paints, varnishes and metallic coatings, methods used in applying coatings on metal surface.

**SECTION - B**

**Plastics:** fundamental characteristics, classification, raw materials, and manufacture of plastics, some typical examples of plastics and their uses. **Fibers:** 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. **Lubricants:** principle of lubrication, sources, properties and refining of lubricants, mechanical and industrial importance of lubrication, **Carbon:** properties and application of carbon and graphite, manufacturing and applications of non- fabricated industrial carbon.

**Text and Ref books:**

1. Chemical Process Industries (5<sup>th</sup> edition) – Norris Shreve & Joseph A. Brink, Jr.
2. Industrial Chemistry – B. K. Sharma.
3. A text Book of Engineering Chemistry – M. M. Uppal.
4. Industrial Chemistry – B. N. Chakrabarty.
5. Corrosion Engineering – Mars G.Fontana & Norbert D. Greene.
6. Design and Corrosion Control – V. R. Pludek.
7. An Introduction to Metallic Corrosion and its Prevention – Raj Narayan.

**Math 161 : Differential and Integral Calculus**

4.00 Contact Hour 4.00 Credit Hour

**SECTION-A (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.

**SECTION-B: 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.

**Math 163 : Vector Analysis, Matrices and Geometry**

4.00 Contact Hour 4.00 Credit Hour

**SECTION-A (Vector analysis and Matrices)**

**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.

**SECTION-B (Coordinate Geometry- 2D & 3D)**

**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 coincides, sphere and ellipsoid.

**Math-261 Ordinary and Partial Differential Equations**

Credit Hr- 4.00, Contract Hr- 4.00

**SECTION-A (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.

**SECTION-B (Partial Differential Equations)**

Introduction, Linear and non linear 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, Integral surface passing through given curve; Nonlinear PDE of order One (Complete, particular, singular and general integrals), Charpit's Method, Second order PDE and classifications to canonical (standard)- parabolic, elliptic, hyperbolic solution by separation of variables, Linear PDE with constant coefficients.

**Math- 263 Fourier Analysis, Harmonic Functions, Laplace Transform and Complex Variables**

**Credit Hr- 4.00, Contract Hr- 4.00**

**SECTION-A (Fourier Analysis and Complex Variables)**

**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 Cauchy-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.

**SECTION-B (Harmonic Functions and Laplace Transform)**

**Harmonic Functions:** Definition of harmonics. Laplace's equation in Cartesian, polar cylindrical and spherical co-ordinates. Solutions of these equations together with applications. Gravitational potential due to a ring, Steady-state temperature. Potential inside or outside of a sphere. Properties of harmonic functions.

**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.

**Hum 101: English**

2.00 Contact Hour, 2.00 Credit Hour/Wk

**SECTION-A**

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.

**SECTION-B**

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.

**Text and Ref books:**

1. Business correspondence and report writing – R. C. Sharma & Krisnamohon.
2. A guide to correct speech – S. M. Amanullah.
3. Advance learners Degree general English – Chowdhury and Hossain.
4. The most common mistakes in English usage – Thoma's Elloft Berry.

**Hum 102 : Technical Report Writing and Presentation**

3.00 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.

**Text and Ref books:**

1. Business correspondence and report writing – R. C. Sharma & Krisnamohon.

**Hum 201 : Sociology**

3.00 Contact Hour 3.00 Credit Hour

Scope of sociology: micro and macro sociology; Some fundamental concepts; Society from savagery to civilisation (table); Social evolution and techniques of production; Social structure of Bangladesh: Oriental and occidental societies; Feudalism.

Industrial revolution: the growth of capitalism, features, social consequences; Socialism; Fascism.

Social control: need, means, future of social control; Leadership: types , functions, techniques, social power.

Society and population: social determinants of fertility and mortality; Human migration; Demographic transition, density, standard of living, population pyramid; Population and world resources; Malthusian, optimum and socialistic population theory; Population problem of Bangladesh.

Social pathology: crime, juvenile delinquency, slum.

Nature of social change: factors of social change - biological, physical, economic, cultural, technological factor; Change in production technology; Means of communication, and transportation; Derivative social effects of converging material inventions; Effects of technology on major social institutions; Social inventions; Urbanisation and industrialisation in Bangladesh.

Sociology of development: process of development, social planning, Planning as a factor of social change, social change in Bangladesh-nature and trend.

Urban ecology: city, pre-industrial and industrial, growth and nature of cities in Bangladesh; Rural sociology: features of village community in Bangladesh; Social mobility, urban-rural contrast; Social structure of the tribal people of Bangladesh.

**Text and Ref books:**

1. Sociology (4<sup>th</sup> edition) – Anthony Giddens, Publisher – Excel Media, India.
2. Sociology: Primary Principles – C. N. Shankar Raw, Publisher – S. Chand Co Ltd.
3. Sociology (Rev. ed.) – T. B. Bottomore.

**Hum 203 : Government**

3.00 Contact Hour 3.00 Credit Hour

Scope; Some fundamental concepts of government and politics; Origin of the state; Stages of development of modern state: nation, nationalism, internationalism; Sovereignty: de jure and de facto sovereignty; Functions of state: individualism, socialism, welfare state, fascism.

Citizenship: rights, duties; Hindrances to good citizenship.

Forms of government: Aristotle's classification, modern classification, democracy, dictatorship, cabinet, presidential, unitary and federal; Organs of government and separation of powers: legislature, executive, judiciary, bureaucracy; The electorate: party system, public opinion.

Local self government.

Socio-political and economic background of the movement for Bangladesh; Government and politics in Bangladesh.

Some major administrative systems; International political organisation: the UNO and its specialised agencies.

**Text and Ref books:**

1. Political Theory – V. D. Mahajan.
2. Principles of Political Sciences – A. C. Kapur.
3. Political Science and Government (9<sup>th</sup> edition) – Hafis Habibur Rahman, Publisher – Idial Publication.

**Hum 213 : Principles of Accounting**

3.00 Contact Hour 3.00 Credit Hour

**SECTION-A**

A study of accounting as an informational system, fundamental accounting concepts and principles used to analyze and record business transactions, Recording system: Double-entry book keeping and accounting, accounting equation, measuring and recording business transactions. Accounting cycle: Journal, ledger, trail balance, preparation of financial statements considering adjusting and closing entries, Financial statements analysis and interpretation: Ratio analysis – tests for profitability, liquidity, solvency and overall measure.

**SECTION- B**

**Cost in general:** Objectives and classifications. Overhead costs: Allocation and apportionment. Product costing: Cost sheet under job costing, process costing, costing by products and joint products.

**Marginal costing:** Tools and techniques; Cost-volume-profit analysis: Meaning, break-even analysis, contribution margin technique, sensitivity analysis, designing the optimal product mix.

**Relevant costing:** Analysis, profitability within the firm. Guidelines for decision-making: Short-run decisions.

**Long run planning and control:** Capital budgeting; the master budget, flexible budget and standard cost, variance analysis.

**Text and Ref Books:**

1. Accounting Principles- Jerry J. Weygandt, Donald E. Kieso, and Paul D. Kimmel Publisher: Wiley; 8 edition
2. Cost Accounting: Theory and Practice- Bhabatosh Banerjee; Publisher: Prentice-Hall of India Pvt.Ltd; 12Rev Ed edition
3. Cost and Management Accounting- Duncan Williamson; Publisher: Prentice Hall



4. Introduction to Management Accounting- Charles T. Horngren, Gary L. Sundem, William O. Stratton, and Jeff Schatzberg; Publisher: Prentice Hall; 14 edition
5. Managerial Accounting 10/e Update Edition- Ray; Noreen, Eric Garrison; Publisher: McGraw-Hill
6. Fundamental Accounting Principles- Kermit Larson, John Wild, and Barbara Chiappetta; Publisher: McGraw-Hill/Irwin; 16 edition

**Hum 223 : Economics**

3.00 Contact Hour 3.00 Credit Hour

**SECTION A**

**Microeconomics:** Definition of economics; Fundamentals of economics; Market and government in a modern economy; Basic elements of supply and demand; Choice and utility; indifference curve technique; Analysis of cost; Short run long run theory of production; Analysis of Market; Optimization; Theory of distribution

**SECTION B**

**Macroeconomics:** key concept of macroeconomics; Saving, consumption, investment; National income analysis; Inflation, Unemployment; Fiscal and monetary policy

**Development:** Theories of developments; Economic problem of developing countries; Planning in Bangladesh

Reference:

Economics by Samuelson

Economics by John Sloman

Economic Development by Michael Todaro

**Hum 227 : Industrial sociology**

3.00 Contact Hour 3.00 Credit Hour

\* *Prereq.: Hum 201*

Nature, scope, aim and rise of industrial sociology; History of industrialisation - ancient and modern; Early industrialisation in India: arts and crafts; Renaissance: industrial revolution in Europe; Development of industry and industrial society in Bangladesh.

The concept of work: work and art, nature of industrial work, work ideology, work values; Role of work in man's life: work and mental health, work attitudes, work involvement; Motivation to work, work satisfaction, commitment to industrial work; Development and commitment of industrial labour force in Bangladesh.

The worker and the factory: the factory system, its characteristics; Formal relations of production in the factory system.

The industrial bureaucracy: the executive in the industrial bureaucracy; Role of the worker: industrial production and the worker's role, social relations at work; Management as a social elite.

Industry and community: industry and family industry and social change, shifting values, influence of convictions, religion and industrial development; Place of industrial worker in the society.

Industry and social stratification: nature and causes of industrial conflict; Role and functions of trade unionism; Resolution of industrial conflict; Collective bargaining.

Industrialisation and development: patterns of industrial development in developing countries - role of foreign capital and borrowed technology; Technology and social structure; Classification of industries: role of cottage industries, labour intensive vs. heavy industries; Modernisation.

**Shop 160 : Foundry and Welding Shops**

3/2 Contact Hour 0.75 Credit Hour

Foundry. Introduction to foundry, tools and equipment; Patterns: function, pattern making; Molding: molding materials sand preparation, types of mold, procedure; Cores: types, core making materials; Metal melting and casting; Inspection of casting and casting defects.

Welding. Metal joints: rivetting, grooving, soldering, welding; Welding practice: electric arc - steel, aluminium; Types of electrode; Welding defects: visual, destructive and non-destructive tests of welding. Gas welding and equipment; Types of flame; Welding of different types of materials; Gas welding defects; Test of gas welding.

**Shop 170 : Machine Shop Practice**

3/2 Contact Hour 0.75 Credit Hour

Tools: common bench and hand tools, marking and layout tools, measuring tools, cutting tools, machine tools; Bench work on jobs; Practices on machine tools: drilling machine, lathe machine, shaper machine, milling machine, grinding machine.

**Text and Ref books:**

1. Machine Shop Practice – James Anderson, W. A. Chapman.

**EECE 159: Fundamentals of Electrical Engineering**

3.00 Contact Hour 3.00 Credit Hour

Laws of electric circuit: Ohm's Law, Kirchhoff's voltage and current laws, delta-wye transformation. Electrical networks: network analysis methods of branch and loop currents, method of node pair voltages, Thevenin's and Norton's theorems, Magnetic concepts and units: magnetic field, right hand rule, magnetic flux density, Biot Savart law, magnetic field intensity, measurement of magnetic flux, energy of magnetic field, characteristic of ferromagnetic materials, theory of ferromagnetism, B-H curve, hysteresis loss, eddy current and eddy current loss, total core loss. Introduction to magnetic circuits. Electromagnetic forces: forces upon a current carrying conductor and charged particles moving in a magnetic field. Electromagnetic torque; electric motor. Electromagnetic induction and emf; Lenz's law, Blv rule, elementary a.c. generator.

General concepts and definitions. Instantaneous current, voltage and power, R-, L-, C-, RL-, RC- and RLC- branches, Effective current and voltage: average values, form factor, crest factor, power real and reactive. Introduction to vector algebra. Impedance in polar and Cartesian forms. Sinusoidal single phase circuit analysis. Impedance in series, parallel branches, series-parallel circuits. Network analysis – Thevenin's theorem. Balanced poly phase circuits: three phase, four wire system of generated emfs, three phase, three wire systems, balanced wye loads, balanced delta loads, power in balanced systems, power factor. Balanced three phase circuit analysis and power measurement.

**Text and Ref books:**

1. Introductory Circuit Analysis – R. L. Boylestad.
2. Introductory Circuit for Electrical & Computer Engineering – James W. Nilson.
3. Alternating Current Circuits – Russel M Kerchner and George F Corcoran.

**EECE 160: Fundamentals of Electrical Engineering Laboratory**

3/2 Contact Hour 0.75 Credit Hour

Laboratory experiments based on EECE 159.

**EECE 259: Electrical and Electronic Technology**

4.00 Contact Hour 4.00 Credit Hour

Single phase transformer-equivalent circuit and laboratory testing, introduction to three phase transformers. DC generator: principle, types, performances and characteristics. D C Motor: principles, types of motor, performances, speed control, starters and characteristics. A C Machines: three phase induction motor principles, equivalent circuit. Introduction to synchronous machines and fractional horse power motors.

Semiconductor diode, transistor characteristics, equivalent circuits, self-biasing circuits, emitter-follower amplifiers, push-pull amplifier. Introduction to silicon controlled rectifier and its application. Oscilloscope. Transducers: strain, temperature, pressure, speed and torque measurements.

**Text and Ref books:**

1. Electric Machines and Transformers – Irving L. Kosow.
2. Electrical Machines Fundamentals – Stephan J. Chapman.
3. A Text Book of Electrical Technology (AC, DC Machines) –B L Theraja and A. K. Theraja.
4. Electronic Divices and Circuit Theries – R. L. Boylsted.

**EECE 260: Electrical and Electronic Technology Laboratory**

3.00 Contact Hour 1.50 Credit Hour

Laboratory experiments based on EECE 259