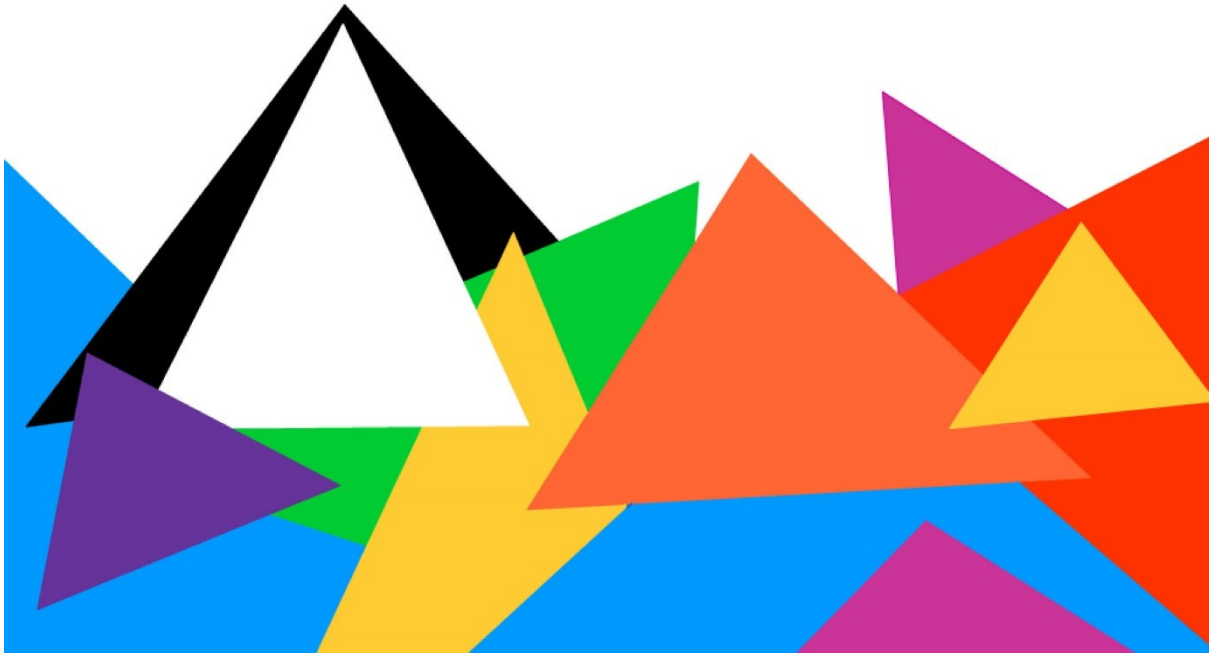
MILITARY INSTITUTE OF SCIENCE AND TECHNOLOGY

Department of Mechanical Engineering

UNDERGRADUATE COURSE CURRICULUM

(New Syllabus applicable from Spring 2019, ME-16 and Onwards)

7th Edition



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CHAPTER 1

GENERAL INFORMATION

1.1. Introduction to MIST

The necessity of establishing a technical institute for the Bangladesh Armed Forces was felt in the late eighties. In the absence of such an institution, officers of Bangladesh Armed Forces had been graduating from Bangladesh University of Engineering and Technology (BUET), Bangladesh Institute of Technology (BIT) and other foreign institutions of science and technology. 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. Bachelor's degree on Computer Science Engineering course started on 2001**.** Bachelor courses on Electrical, Electronic & Communication Engineering and Mechanical Engineering started its journey from 2003. Bachelor of Science program on Aeronautical Engineering (AE) and Naval Architecture and Marine Engineering (NAME) program were started from 2008-2009 and 2012-2013 respectively. Besides, four new departments started their academic session from 2014-2015 i.e. Nuclear Science & Engineering (NSE), Biomedical Engineering (BME), Architecture (Arch) and Environmental, Water Resources & Coastal Engineering (EWCE).

1.2 Vision and Mission of MIST

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

Mission: MIST is working on following missions:

a. Provide comprehensive education and conduct research in diverse disciplines of science, engineering, technology and engineering management.

b. Produce technologically advanced intellectual leaders and professionals with high moral and ethical values to meet the socio- economic development of Bangladesh and global needs.

c. Conduct collaborative research activities with national and international communities for continuous interaction with academia and industry.

d. Provide consultancy, advisory, testing and other related services to government, non-government and autonomous organization including personal for widening practical knowledge and to contribute in sustainable development of the society.

1.3 Motto and Values of MIST

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

Values:

a. **Integrity and Respect-**We embrace honesty, inclusivity, and equity in all that we do.
b. **Honesty and Accountability-**Our actions reflect our values, and we are accountable for both.
c. **Dedication to Quality and Intellectual Rigor-**We strive for excellence with energy, commitment and passion.
d. **Pursuit of Innovation-**We cultivate creativity, adaptability and flexibility in our students, faculty and staff.

1.4 Eligibility of Students for Admission in MIST

The students must fulfill the following requirements:

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

(1) The applicant must have passed SSC/equivalent examination in Science Group obtaining GPA 4.00 (without fourth subject) in the scale of 5.0 and in HSC/Equivalent examination from Board of Intermediate and Secondary Education/Madrasa Education Board/Technical Education Board in science group the applicant must have obtained minimum 'A+' (Plus) in any TWO(2) subjects out of FIVE (5) subjects including Mathematics, Physics, Chemistry, English, and Bengali and 'A' in rest THREE (3) subjects.
(2) The applicant must have qualified in minimum five subjects including Mathematics, Physics, Chemistry and English Language with minimum 'B' in average in GCE 'O' Level and in 'A' level he/she must have obtained minimum 'A' in ONE subject out of three subjects including Mathematics, Physics, and Chemistry with and minimum 'B' in rest TWO subjects.
(3) Applicants who have passed HSC or Equivalent examination in the current year or one year before the notification for admission can apply.
(4) Sex: Male and Female.

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

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

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

(3) Sex: Male and Female.

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

1.5 Number of Seats.

The highest number of seats for 04(Four) years bachelor's degree in engineering programs (Unit – A) and 5 (Five) years bachelor's degree of Architecture programmes are as follows:

Allocation of Seats

Ser	Unit	Department	Seats
1	A	Civil Engineering (CE)	60
2		Computer Science and Engineering (CSE)	60
3		Electrical, Electronic & Communication Engineering (EECE)	60
4		Mechanical Engineering (ME)	60
5		Aeronautical Engineering (AE)	50
6		Naval Architecture and Marine Engineering (NAME)	40
7		Biomedical Engineering (BME)	40
8		Nuclear Science and Engineering (NSE)	40
9		Civil & Environmental Engineering	60
		Civil & Water Resources Engineering	
10		Industrial and Production Engineering (IPE)	50
11		Petroleum and Mining Engineering (PME)	25
12	B	Architecture (Arch)	25
	Total		570

The total number is 570. In general, about 50% seats will be allocated to military officers. However, in case of the requirement of military students' vacancy is less in any particular year, the deficient vacancy will be filled up by civil students. MIST also maintains quota as mentioned below:

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

1.6 Admission Procedure

1.6.1 Syllabus for Admission Test.

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

Ser.	Subjects	Marks
a.	Mathematics	60
b.	Physics	60
c.	Chemistry	60
d.	English	20
		Total = 200

1.6.2 Final Selection. Students will be selected on the basis of results of the admission test. 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.

The under graduate (B.Sc) Engineering programs for all engineering disciplines are planned for 04 regular levels, comprising of 08 regular terms for Architecture program it is planned for 3 & regular levels, comprising of 10 regular terms. It is expected that all students will earn degree by clearing all the offered courses in the stipulated time. In case of failure the following policies will be adopted:

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

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

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

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

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

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

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

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

1.7.2 Withdrawal on Disciplinary Ground

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

(1) Communicating with fellow students for obtaining help in the examination.

(2) Copying from another student's script/ report /paper.

(3) Copying from desk or palm of a hand or from other incrimination documents.

(4) Possession of any incriminating document whether used or not.

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

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

d. **Immediate Action by the Disciplinary Committee of MIST.** The Disciplinary Committee, MIST may take immediate disciplinary action against any student of the Institution. 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. **Permanent Withdrawal.** A student who has already completed some courses and has not performed satisfactorily may apply for a withdrawal.

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

CHAPTER 2

RULES AND REGULATIONS FOR UNDERGRADUATE PROGRAMME AT MIST

2.1 The Course System

The salient features of the Course System are as follows:

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

b. Students will not face any level repeat for failing.

c. Students will get scope to improve their grading.

d. Introduction of more optional courses to enable the students to select courses according to their individual needs and preferences.

e. Continuous evaluation of students' performance.

f. Promotion of student-teacher interaction and contact.

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

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

2.2 Number of Terms in a Year

There will be two terms (Term I and Term II) in an academic year. In addition to these two regular terms there will be a short term after the Term II of each academic session. During the short term, students can take only failed courses to cover up the credit deficiencies.

Respective departments will take the decisions about courses to be offered during each short term depending upon the availability of course teachers and number of students willing to take a particular course.

2.3 Duration of Terms

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

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

The duration of a Short Term will be around 7 weeks of which about 6 weeks will be spent for class lectures and one week for Term Final Examination. The duration for Short Term and Examination will be as under:

1.	Classes	6 weeks
2.	Final Examination	1 week
Total		**7 Weeks**

2.4 Course Pattern and Credit Structure

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

2.5 Course Designation System

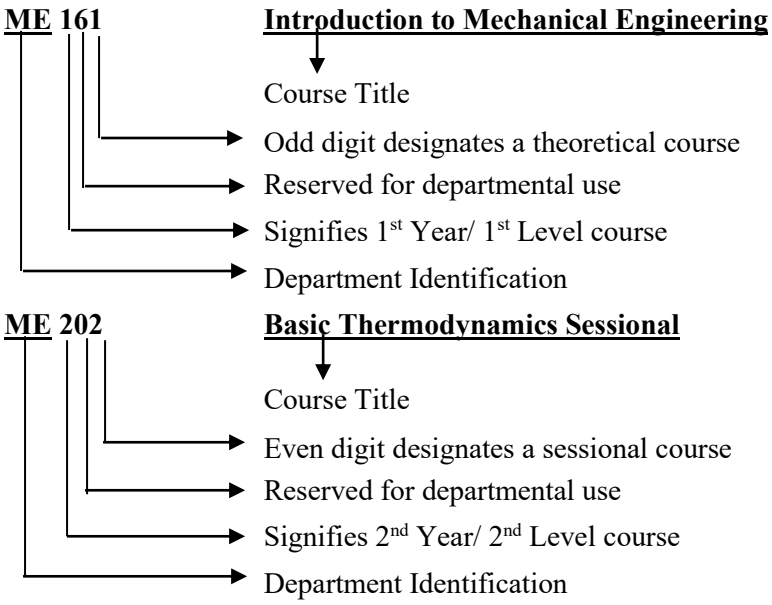
Each course is designated by a maximum of three/four letter code identifying the department offering the course followed by a three-digit number having the following interpretation:

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

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

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

The course designation system is illustrated as Follows:



2.6 Assignment of Credits

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

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

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

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

2.7 Types of Courses

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

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

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

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

2.8 Course Offering and Instruction

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

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

2.9 Teacher Student Interaction

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

2.10 Student Adviser

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

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

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

2.11 Course Registration

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

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

2.11.2 Pre-conditions for Registration.

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

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

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

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

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

2.12 Limits on the Credit Hours to be taken

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

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

2.13 Course Add/Drop

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

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

2.14 Withdrawal from a Term

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

2.15 The Grading System

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

acquired in order to qualify for the degree. Letter grades and corresponding grade points will be given as follows:

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

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

2.16 Distribution of Marks

Theory. Forty percent (40%) of marks of a theoretical course shall be allotted for Continuous Assessment, i.e. assignments, class tests, pop quizzes, observations, projects and mid-term assessment. These marks must be submitted to Office of the Controller of Examinations before commencement of the final exam. The rest of the marks will be allotted to the Term Final Examination. The duration of final examination will be three (03) hours. The scheme of continuous assessment that a particular teacher would follow for a course will be announced on the first day of the classes. Distribution of marks for a given course per credit is as follows:

Assessment Method	(100%)
Class Assessment	
Class Performance	**05**
Mid-Term Assessment (Exam/Project)	**15**
Class Test/Assignment	**20**
Exam	
Final exam	**60**

Note:

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

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

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

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

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

Assessment Method	**(100%)**
Class Assessment	
Conduct of Lab Tests/Class Performance	**25%**
Report Writing/Programming	**15%**
Mid-Term Evaluation (exam/project/assignment)	**20%**
Final Evaluation (exam/project/assignment)	**30%**
Viva Voce/Presentation	**10%**
Total	**100%**

Note: the above distribution of percentage is a general guideline. Department can rearrange to some extent if required. Class attendance may be considered as a part of continuous assessment. No mark should be allotted for attending classes.

2.17 Collegiate and Non-collegiate

Students having class attendance of 90% or above in individual subject will be treated as collegiate and less than 90% and up to 75% will be treated as non-collegiate in that subject. The non-collegiate student(s) may be allowed to appear in the examination subject to payment of non-collegiate fee/fine of an amount fixed by MIST/BUP. Students having class attendance below 75% will be treated as dis-collegiate and will not be allowed to appear in the examination and treated as fail. But in a special case such students may be allowed to appear in the examination with the permission of Commandant and it must be approved by the Academic Council.

2.18 Calculation of CGPA

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 C1, C2, ..., Cn and his grade points in these courses are G1, G2, ...

Gn respectively, then

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

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

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

The Cumulative Grade Point Average (CGPA) is the weighted average of the GPA obtained in all the terms passed/completed by a student. For example, if a student passes/ completes n terms having total credits of TC1, TC2, ... , TCn and his GPA in these terms are GPA1, GPA2,... , GPAn, respectively then

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

A Numerical Example

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

Course	Credits, C_i	Grade	Grade Points, G_i	C_i*G_i
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
Total	21.00			72.375

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_I	GPA Earned, GPA_i	GPA_i*TC_i
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
Total		**81.50**		**318.105**

CGPA = 318.105/81.50 = 3.90

2.19 Minimum Earned Credit and GPA Requirement for Obtaining Degree

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

2.20 Impacts of Grade Earned

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

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

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

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

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

2.20 Classification of Students

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

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

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

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

b. **Category 2:** This category consists of students who have earned a minimum of 15 credits but do not belong to category 1. A student belonging to this category is advised to take at least one course less since he might have to register for one or more backlog courses as prescribed by his/her adviser.

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

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

2.22 Performance Evaluation

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

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

a. The term GPA falls below 2.20.

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

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

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

2.23 Rules for Self-Study Courses

A self-study course is among the regular courses listed in the course catalog. This type of course is offered only in exceptional cases. The following rules are applicable to all self-study courses:

a. Whether a course is to be floated as a self-study course will be decided by the Head of the concerned department in consultation with the teacher/course coordinator concerned. Such a decision also has to be reported to the Academic Council.

b. A self-study course may be offered in a particular term only if the course is not running in that term as a regular course.

c. The self-study course is offered to a student in his/her graduating term if it helps him/her to graduate in that term.

d. A student is allowed to register for a maximum of two theory courses on a self-study basis.

e. Students should have 75% class attendance.

f. Normally no lecture will be delivered for a self-study course but laboratory/design classes may be held if they form part of a course.

g. The course coordinator/course teacher will assign homework, administer quizzes, and final examination for giving assessments at the end of the term.

h. No Laboratory/Sessional Course can be taken as self-study course.

2.24 Rules for Courses Offered in Short Term

A Short-Term course will be conducted after one week of completion of Term II Final Examination in each year. The following rules are applicable to Short Term courses:

a. The courses to be run during the short term shall be decided on the recommendations of departments on the basis of essential deficiencies to be made up by a group of students. Once floated, other students could be allowed to register in those courses subject to the capacity constraints and satisfaction of prerequisites.

b. Student will be allowed to register in a maximum of three theory courses during the Short Term.

c. Graduating students may register for Short Term examinations after finalization of result of Term 2 final examination.

d. A certain fee for each credit hour to be registered to be borne by the students who enroll during Short Term.

2.25 Minimum Earned Credit and GPA Requirement for Obtaining Degree

Minimum credit hour requirements for the award of bachelor's degree in engineering (BSc. Engg) and architecture (B. Arch.) will be decided by the respective department (BUGS). However, at least 157 credit hours for engineering and 189 credit hours for architecture must be earned to be eligible for graduation, and this must include the specified core courses. The minimum GPA requirement for obtaining a Bachelor's degree in engineering and architecture is 2.20.

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

2.26 Application for Graduation and Award of Degree

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

2.27 Time Limits for Completion of Bachelor's Degree

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

2.28 Attendance, Conduct and Discipline

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

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

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

2.29 Teacher-Student Interaction

The academic system in MIST encourages students to come in close contact with the teachers. For promotion of high level of teacher-student's interaction, a course coordinator (CC) is assigned to each course. Students are free to discuss with CC about all academic matters. Students are also encouraged to meet other teachers any time for help and guidance for academic matters. Heads of the departments, Director of Administration, Director of Students Welfare (DSW), Dean and Commandant address the students at some intervals. More so, monthly Commandant's Parade is organized in MIST where all faculty members, staff and students are formed up, thereby increasing teacher-student interaction.

2.30 Absence during a Term

A student should not be absent from quizzes, tests, etc. during the term. Such absence will naturally lead to reduction in points/marks, which count towards the final grade. Absence in the Term Final Examination will result in an F grade in the corresponding course. A student who has been absent for short periods, up to a maximum of three weeks due to illness, should approach the course teacher(s) or the course coordinator(s)

for make-up quizzes or assignments immediately upon return to classes. Such request has to be supported by medical certificate from competent authority (e.g. CMH/MIST Medical Officer).

2.31 Recognition of Performance

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

2.32 Types of Different Examination

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

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

b. **Short Term Examination:** Short Term may be conducted after one-week completion of Term 2 final examination. Students will be allowed to take maximum three theoretical courses in the Short Term. Examination will be conducted at the end of Short Term (6^{th} week class). However, Head of concerned department with the approval of Commandant may decide to take Supplementary examination instead of Short Term. No Laboratory/Sessional Courses can be taken in short term.

c. **Supplementary Examination:** It will take place once in a year, after each Term-I final break. It should be completed within first 3 weeks of a new term. Students will be allowed to appear this examination for one subject at a time. Graduating students will be allowed to appear maximum two subjects during supplementary examination in their last Term. However, Head of the concerned department with the approval of Commandant may decide to take another Supplementary Examination instead of Short Term. In that case, a student will be allowed to take only one failed course in the particular Supplementary Examination. This examination will be conducted in the previous week of the beginning of Term I. Highest achieved grade for all courses of Supplementary Examination will be B+.

d. **Improvement Examination:** It will be taken during supplementary and short term examination. Questions will be same as the question of the regular examination of that Short Term Final Examination (if any). Student can take two subject at a time and maximum 6 subjects in the whole academic duration. If a student obtains a grade lower than 'B+' in a course, he/she will be allowed to repeat the course only once for grade improvement. However, he/she will not be eligible to get a grade better then 'B+' for an improvement course. Among the previous result and improvement examination result, best one will be considered as final result for an individual student. However, performance of all examination i,e previous to improvement examination, shall be reflected in the transcript.

e. **Self-Study Course Examination:** Only graduating students (level-4) will be allowed to appear at Self Study course examination. It will be taken with Term Final Examination. No regular class will be arranged for this, but teachers will be assigned for supervising and guiding the students for

study, conducting class test/quiz and regular assessment for 30% marks. Maximum two theory courses may be taken as self-study course by a student. Highest achieved grade for these courses will be B+. In that case a student will be allowed to take maximum 24 credit instead of 15 in the last Term of his/her graduation.

2.33 Rules of Different Examinations

Term Final Examination. Following rules to be followed:

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

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

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

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

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

Short Term Examination. Following rules to be followed:

a. Short Term for period of 6 weeks may be offered by a department after one week of completion of Term II Final Examination.

b. Short Term Final Examination is to be conducted on 7th week of Short Term.

c. Only repeat course can be offered, not any fresh course.

d. Classes will be arranged for the students who register a failed course in the Short Term.

e. After 6 (six) weeks of class, in the 7th week short Term Examination will be held. Academic calendar for this Short Term will be declared by the Department during the Mid-Term break of Term-II.

f. One student can take only three (failed/improvement) courses at a time in the Short Term.

g. Students will have to complete registration of course for Short Term by paying all the fees, before starting of the Term-II final Exam.

h. Graduating students may register for Short Term examinations after finalization of result of T 2 final examination.

j. Maximum grading will be 'B+'.

k. Question Setting, Moderation, Result Publication will be done following the same rules of Term Final Exam as per Exam Policy. Separate Tabulation sheet will be made for this examination.

l. However, Head of concerned department with the approval of Commandant may decide to take Supplementary Examination instead of Short Term.

Supplementary Examination. Following rules to be followed:

a. After the final break of every Term-I, Supplementary Examination will be held (once in a year).

b. Examination will be taken on 70% marks like Term Final examination. Remaining 30% marks on continuous assessment earned previously in that particular course will be counted. If a student fails in a course more than once in regular terms, then best one of all continuous assessment marks will be counted.

c. A student will be allowed to take one course at a time for each supplementary examination, but in the graduating Term one student can take two courses if required.

d. Highest grade of supplementary examination will be 'B+'.

e. Registration for supplementary courses to be done during the mid-term break of Term 1, paying the required fees.

f. Examination will be completed after Term I End break within three weeks of Term II.

g. If any student fails in a course, he can clear the course retaking it 2nd time or, he can clear the examination appearing at the supplementary examination as well. Anyone fails twice in a course, can only retake it in regular or short term for appearing third time. But if anyone fails even after appearing third time, he has to take approval from Academic Council of MIST for appearing last time in a course.

h. If anyone fails in the sessional course, that course cannot be cleared in the supplementary examination.

j. Question setting, Moderation, Result Publication will be done following the same rules of Term Final Examination as per Examination Policy.

k. However, Head of the concerned department with the approval of Commandant may decide to take another Supplementary Examination instead of Short Term. In that case, a student will be allowed to take only one failed course in that particular Supplementary Examination. This examination will be conducted in the previous week of the beginning of Term 1. Registration of that Supplementary Examination should be completed during registration of Short Term course.

Improvement Examination. Following rules to be followed:

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

b. Highest grade of Improvement examination will be 'B+'.

c. One student is allowed to appear at Improvement exam in 6 (six) courses in his whole graduation period taking maximum two courses at a time.

d. For Improvement examination, registration is to be done before Term 2 Final Examination with the Short Term Courses or, during the registration of Supplementary Courses by paying all the fees.

e. Improvement examination to be taken during the supplementary and short term examinations.

f. Choice of Improvement course is restricted within the offered courses of that Short Term by the Departments and in two courses at a time.

g. Question Setting, Moderation and Result Publication to be done with courses of regular Term Final Examination.

Self-Study Course and Examination. Following Rules to be followed:

a. An irregular student for completion of his graduation, can take maximum two repeat courses as self-study course in the graduating Term if he desires and is accepted by department.

b. One student can take maximum 24 credit hours course in the graduating Term to complete his graduation.

c. Registration for self-study course by paying all fees, must be completed with other course of regular Term.

d. To run the self-study course, concerned Department will assign one teacher each for every self-study course offered. No regular theory class will be held, but that assigned teacher will take necessary class Tests, Quiz Test and give attendance and observation marks to give 30% marks at the end of the Term. For remaining 70% marks written examination will be taken with the Term Final Examination.

e. Assigned teacher for self-study examination will be responsible for setting questions of 70% marks and other examination formalities.

f. Question Setting, Moderation, and Result Publication to be done with courses of Term Final Examination.

g. Grading of Self Study course and examination will be maximum 'B+'.

2.34 Irregular Graduation

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

CHAPTER 3

DEPARTMENT OF MECHANICAL ENGINEERING

3.1 Introduction to the program

Department of ME commenced undergraduate programs from January 2003 with 45 students. Mechanical Engineers apply the principles of mechanics and energy to the design of machines and devices. They must be able to control mechanical systems and usually work with other professionals in designing these systems. Automobiles, engines, heating and air-conditioning system, gas and steam turbines, air and space vehicles, trains, ships, servomechanisms, transmission mechanisms, machine tools, material handling systems, elevators and escalators, and robots used in industry are a few of the systems and devices requiring mechanical engineering knowledge.

The Department of Mechanical Engineering offers dynamic educational programs and a faculty poised to deliver quality engineering education. The department also offers studies leading to the Bachelor of Science in Mechanical Engineering, Master of Engineering and the Ph.D.

With its excellent professional views and capabilities of teaching, BSc in Mechanical Engineering (BSc ME) degree program has received accreditation from BAETE, IEB on March 2010 with a grade as "Good".

3.2 Vision and Mission of the Program

Vision: To be an internationally recognized center of excellence offering a study program of high-quality teaching, research-related consultancy and outreach activities with national relevance, innovation and creativity in the field of Mechanical Engineering.

Mission:

To produce engineers and researchers with sound knowledge on fundamentals of traditional, modern and emerging areas of Mechanical Engineering together with innovative design abilities and managerial skills, which are essential to achieve sustainable national development.

MD1 To Provide quality education in mechanical Engineering and Management.

MD2 To Establish a continuous industry institute interaction, participation and collaboration to contribute skilled Mechanical Engineers.

MD3 To Impart human, socio-ethical values and entrepreneurship skills among Mechanical Engineers.

MD4 To Promote Research and Development (R & D) and Innovative Technologies in the Emerging Areas of Mechanical Engineering

3.3 Program Outcomes

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

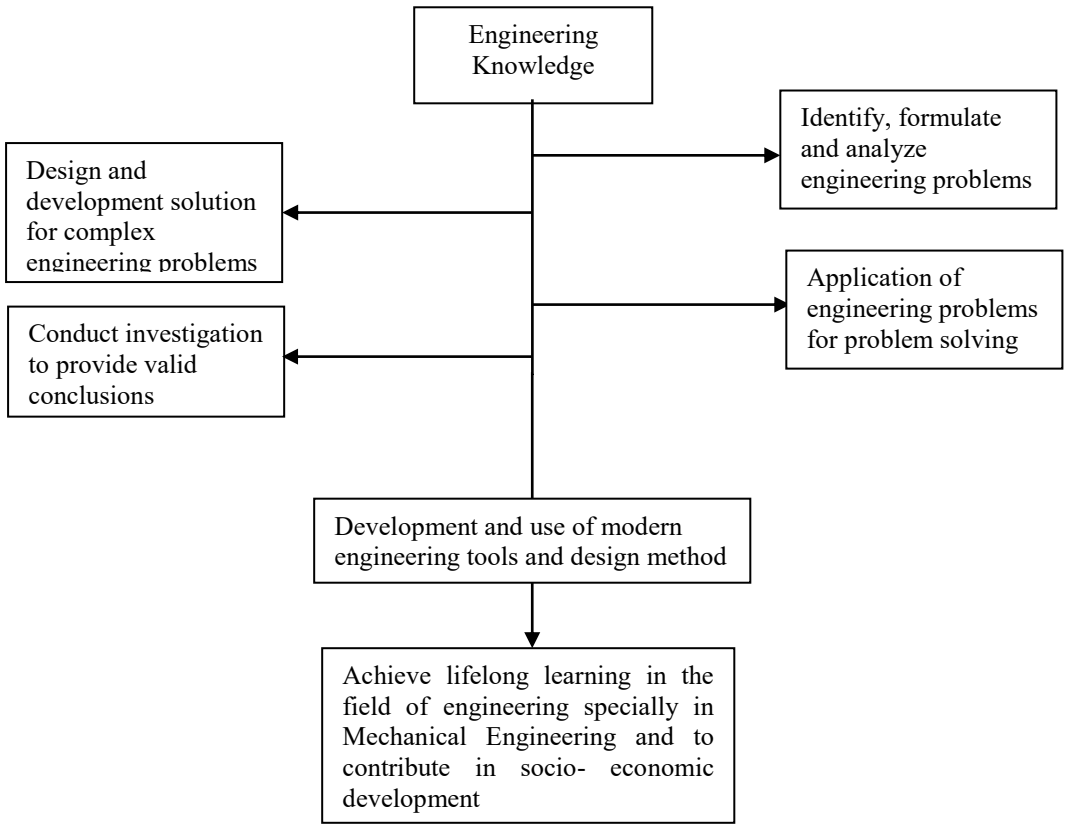
1. **Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals and an engineering specialization to the solution of complex engineering problems.
2. **Problem analysis:** Identify, formulate, research the literature and analyze complex engineering problems and reach substantiated conclusions using first principles of mathematics, the natural sciences and the engineering sciences.
3. **Design/development of solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for public health and safety as well as cultural, societal and environmental concerns.
4. **Investigation:** Conduct investigations of complex problems, considering design of experiments, analysis and interpretation of data and synthesis of information to provide valid conclusions.

5. **Modern tool usage:** Create, select and apply appropriate techniques, resources and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
6. **The engineer and society:** Apply reasoning informed by contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to professional engineering practice.
7. **Environment and sustainability:** Understand the impact of professional engineering solutions in societal and environmental contexts and demonstrate the knowledge of, for sustainable development.
8. **Ethics:** Apply ethical principles and commit to professional ethics, responsibilities and the norms of the engineering practice.
9. **Individual work and teamwork:** Function effectively as an individual and as a member or leader of diverse teams as well as in multidisciplinary settings.
10. **Communication:** Communicate effectively about complex engineering activities with the engineering community and with society at large. Be able to comprehend and write effective reports, design documentation, make effective presentations and give and receive clear instructions.
11. **Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work as a member or a leader of a team to manage projects in multi-disciplinary environments.
12. **Life-long learning:** Recognize the need for and have the preparation and ability to engage in independent, life-long learning in the broadest context of technological change.

3.4 Generic Skills

1. Apply the principles and theory of mechanical engineering knowledge to the requirements, design and development of different electrical systems with appropriate understanding.
2. Define and use appropriate research methods and modern tools to conduct a specific project.
3. Learn independently, be self- aware and self- manage their time and workload.
4. Apply critical thinking to solve complex engineering problems
5. Analyze real time problems and justify the appropriate use of technology
6. Work effectively with others and exhibit social responsibility

3.5 Curriculum/ Skill mapping



CHAPTER 4

COURSE CURRICULUM FOR BACHELOR DEGREE IN ME

4.1 Course Schedule

Keeping the above-mentioned program outcome, the course schedule for the undergraduate students of the Department of Mechanical Engineering is given below:

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	-	3+0.0	6+1.5	3+1.5	3+0.75	-	18.75
1-II	2+0.75	4+0.0	6+1.5	3+3	-	-	20.25
2-I	2+0.0	4+0.0	-	6+2.25	3+1.5	-	18.75
2-II	4+0.0	4+0.0	-	9+1.5	-	-	18.50
3-I	-	-	-	16+6.5	-	-	22.50
3-II	-	-	-	16+5.75	-	-	21.75
4-I	-	-	-	9+4.5	-	6**+0.0	19.50
4-II	-	-	-	9+6.0	-	6**+0.0	21.00
Total	8.0+0.75 =8.75	15+0 =15	12+3.0 =15	71.0+31.0 = 102	6+2.25 =8.25	12+0 =12	161.00
% of total theory course	6.45%	12.1%	9.67%	57.26%	4.84%	9.67%	
% of total course	5.43%	9.32%	9.32%	63.35%	5.12%	7.45%	

Table: Summary of Course Curriculum

4.2 Contact Hours and Credit Hours Distribution in Eight Terms

Level Term	Contact hours for theory courses	Contact hours for sessional courses	Cumulative contact hours	Cumulative credit hours
1-I	15.0	7.5	22.5	18.75
1-II	15.0	10.5	48.00	39.00
2-I	15.0	7.5	70.5	57.75
2-II	15.0	3.0	90.5	76.25
3-I	16.0	10.0	119.5	98.75
3-II	16.0	11.5 + 06 Weeks	144+ 06 Weeks	120.50
4-I	15.0	9.0	168+ 06 Weeks	140.00
4-II	15.0	12.0	195+ 06 Weeks	161.00
Total	127.0	66.0+ 04 Weeks	**195+ 06 Weeks**	**161.00**

4.3 Term-wise Distribution of Courses

LEVEL- 1 TERM-I

Course No	Course Name	Type of Course	Contact hours	Credit Hours
ME 161	Introduction to Mechanical Engineering	Theory	3.00	3.00
EECE 159	Fundamentals of Electrical Engineering	Theory	3.00	3.00
Phy 109	Physics-I	Theory	3.00	3.00
Chem 103	Chemistry-I	Theory	3.00	3.00
Math 161	Mathematics-I	Theory	3.00	3.00
			15.00	**15.00**
ME 160	Mechanical Engineering Drawing-I	Sessional	3.00	1.50
EECE 160	Fundamental of Electrical Engineering Sessional	Sessional	1.50	0.75
Chem 114	Inorganic Quantitative Analysis Sessional	Sessional	3.00	1.50
			7.50	**3.75**
Contact hours: **22.50**; Credit hours: **18.75**				

LEVEL-1 TERM-II

Course No	Course Name	Type of Course	Contact hours	Credit Hours
ME 171	Computer Programming Language	Theory	3.00	3.00
Phy 107	Physics-II	Theory	3.00	3.00
Chem 143	Chemistry-II	Theory	3.00	3.00
Math 165	Mathematics – II	Theory	4.00	4.00
Hum 101	English	Theory	2.00	2.00
			15.00	**15.00**
Shop 162	Workshop Technology Sessional	Sessional	3.00	1.50
ME 172	Computer Programming Language Sessional	Sessional	3.00	1.50
Hum 102	Technical Report Writing and Presentation	Sessional	1.50	0.75
Phy 102	Physics Sessional	Sessional	3.00	1.50
			10.50	**5.25**
Contact hours: **25.50**; Credit hours: **20.25**				

LEVEL –2, TERM – I

Course No	Course Name	Type of course	Contact hours	Credit hours
ME 203	Engineering Thermodynamics	Theory	3.00	3.00
ME 245	Engineering Mechanics-I	Theory	3.00	3.00
EECE 259	Electrical and Electronics Technology	Theory	3.00	3.00
Math 265	Mathematics-III	Theory	4.00	4.00
Hum 233	Principles of Accounting	Theory	2.00	2.00
			15.00	**15.00**
EECE 260	Electrical and Electronics Technology Sessional	Sessional	3.00	1.50
ME 260	Mechanical Engineering Drawing –II	Sessional	3.00	1.50
ME 204	Engineering Thermodynamics Sessional	Sessional	1.50	0.75
			7.50	**3.75**
Contact hours: **22.50**; Credit hours: **18.75**				

LEVEL-2, TERM –II

Course No	Course Name	Type of course	Contact hours	Credit hours
ME 243	Mechanics of Solids	Theory	3.00	3.00
ME 247	Engineering Mechanics - II	Theory	3.00	3.00
ME 293	Engineering Materials	Theory	3.00	3.00
Math 267	Mathematics - IV	Theory	4.00	4.00
Hum 237	Engineering Economics	Theory	2.00	2.00
Hum 235	Sociology and Engineering Ethics	Theory	2.00	2.00
			17.00	**17.00**
ME 244	Mechanics of Solids Sessional	Sessional	1.50	0.75
ME 294	Engineering Materials Sessional	Sessional	1.50	0.75
			3.00	**1.50**
Contact hours: **20.00**; Credits hours : **18.50**				

LEVEL – 3, TERM –I

Course No	Course Name	Type of course	Contact hours	Credit hours
ME 305	Heat and Mass Transfer	Theory	4.00	4.00
ME 321	Fluid Mechanics – I	Theory	3.00	3.00
ME 341	Machine Design –I	Theory	3.00	3.00
ME 345	Mechanics of Machinery	Theory	3.00	3.00
ME 363	Numerical Analysis	Theory	3.00	3.00
			16.00	**16.00**
ME 306	Heat and Mass Transfer Sessional	Sessional	3.00	1.50
ME 364	Numerical Analysis Sessional	Sessional	3.00	1.50
ME 322	Fluid Mechanics Sessional – I	Sessional	1.50	0.75
ME 366	Integrated Design Project I	Sessional	4.00	2.00
ME 346	Mechanics of Machinery Sessional	Sessional	1.50	0.75
			13.00	**6.50**
Contact hours: **29.00** ; Credit hours : **22.50**				

LEVEL –3, TERM – II

Course No	Course Name	Type of course	Contact hours	Credit hours
ME 307	Heat Transfer Equipment Design	Theory	3.00	3.00
ME 323	Fluid Mechanics – II	Theory	3.00	3.00
ME 343	Machine Design – II	Theory	3.00	3.00
ME 361	Instrumentation and Measurement	Theory	3.00	3.00
ME 333	Manufacturing Technology	Theory	4.00	4.00
			16.00	**16.00**
ME 324	Fluid Mechanics Sessional – II	Sessional	1.50	0.75
ME 334	Manufacturing Technology Sessional	Sessional	1.50	0.75
ME 368	Engineering Simulation Sessional	Sessional	1.50	0.75
ME 366	Integrated Design Project II	Sessional	4.00	2.00
ME 372*	Industrial Training	Training	6 weeks	1.50
			8.5+ 6 weeks	**5.75**
Contact hours: **24.50 + 06** Weeks; Credit hours : **21.75**				

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

LEVEL – 4, TERM – I

Course No	Course Name	Type of course	Contact hours	Credit hours
ME 401	Internal Combustion Engines	Theory	3.00	3.00
ME 421	Fluid Machinery	Theory	3.00	3.00
ME 405	Refrigeration and Building Mechanical Systems	Theory	3.00	3.00
Optional I[1]	Selected from prescribed optional subjects	Theory	3.00	3.00
Optional II[1]	Selected from prescribed optional subjects	Theory	3.00	3.00
			15.00	**15.00**
ME 402	Heat Engines Sessional	Sessional	1.50	0.75
ME 422	Fluid Machinery Sessional	Sessional	1.50	0.75
ME 400	Project and Thesis I	Sessional	6.00	3.00
			9.00	**4.50**
Contact hours: **24.00**; Credit hours: **19.50**				

LEVEL – 4, TERM – II

Course No	Course Name	Type of course	Contact hours	Credit hours
ME 403	Power Plant Engineering	Theory	3.00	3.00
ME 481	Industrial Management	Theory	3.00	3.00
ME 467	Automobile Engineering	Theory	3.00	3.00
Optional III[2]	Selected from prescribed optional subjects	Theory	3.00	3.00
Optional IV[2]	Selected from prescribed optional subjects	Theory	3.00	3.00
			15.00	**15.00**
ME 404	Power Plant Engineering Sessional	Sessional	1.50	0.75
ME 468	Automobile Engineering Sessional	Sessional	3.00	1.50
ME 486	Engineering Research & Business Communication Sessional	Sessional	1.50	0.75
ME 400	Project and Thesis II	Sessional	6.00	3.00
			12.00	**6.00**
Contact hours : **27.00** ; Credit hours : **21.00**				

4.4 List of Elective Courses

Course No	Course Name	Level-Term	Contact Hours	Credit Hours
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 415	Advanced Programming with MATLAB	4-I or 4-II	3.0	3.00
ME 417	Engineering Multiphase Flows	4-I or 4-II	3.0	3.00
ME 419	Introduction to Nanomaterials and Nanotechnology	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 431	Finite Element Method	4-I or 4-II	3.0	3.00
ME 433	Fluidics	4-I or 4-II	3.0	3.00
ME 435	Introduction to CFD	4-I	3.0	3.00
ME 437	Design of Fluid Machines	4-I or 4-II	3.0	3.00
ME 439	Bio-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 453	Applied Aerodynamics	4-I or 4-II	3.0	3.00
ME 461	Control Engineering	4-I or 4-II	3.0	3.00
ME 463	Petroleum Engineering	4-I or 4-II	3.0	3.00

ME 465	Automotive Chassis Component Design	4-I or 4-II	3.0	3.00
ME 469	Vehicle Dynamics	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 485	Introduction to Nuclear Engineering	4-I or 4-II	3.0	3.00
ME 491	Mems Devices - Design and Fabrication	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 499	Weapon Engineering	4-I or 4-II	3.0	3.00

CHAPTER 5

COURSE DESCRIPTION

5.1 CORE COURSES OFFERED

ME 160: Mechanical Engineering Drawing-I

3.00 Contact Hour; 1.50 Credit Hour

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
4. Mechanical Engineering Drawing- AC Mandal & M.Q. Islam

Course Objectives:

1. To enable students to acquire and use engineering drawing skills as a means of accurately and clearly communicating ideas, information and instructions.
2. To enable students to acquire requisite knowledge, techniques and attitude required for advanced study of engineering drawing.

Course Synopsis:

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.

Course Outcomes:

1. The students should be proficient in using engineering drawing apparatus, materials and techniques.
2. Students should be able to use and interpret standard conventions used in engineering drawing.

ME 161: Introduction to Mechanical Engineering

3.00 Contact Hour; 3.00 Credit Hour; Pre-requisite: **None**

Text and Ref Books:

1. A Text Book of Thermal Engineering - R S Khurmi & J K Gupta
2. Heat Engines – D. A. Low
3. Principles of Energy Conversion– AWCulp
4. Basic Mechanical Engineering– R.K.Rajput

Course Objectives:

This course will introduce the students to the field of mechanical engineering and the relationships between physics, mathematics, communications, and science which inform the study, design, and manufacture of mechanical products and systems.

Course Synopsis:

Scope of Mechanical Engineering, 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; Fluid

Machinery, Refrigeration and air–conditioning systems, Introduction to machine elements and electro-mechanical systems.

Course Outcomes:

1. Identify the core areas of mechanical engineering.
2. Describe some of the subfields of mechanical engineering and important components of engineering design and project management.
3. Employ engineering measurements, units, and conversions along with distinguish mechanical engineering from other types of engineering.
4. Demonstrate an understanding of engineering ethics and ethical dilemmas and describe intellectual property and copyright issues in an engineering context.
5. Perform basic oral and written technical communication according to the accepted standards of the mechanical engineering community.

ME 171: Computer Programming Language

3.00 Contact Hour; 3.00 Credit Hour; Pre-requisite: **None**

Text and Ref Books:

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

Course Objectives:

1. The course is designed to provide complete knowledge of C language.
2. Students will be able to develop logics which will help them to create programs, applications in C.
3. Learning the basic programming constructs they can easily switch over to any other language in future.

Course Synopsis:

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.

Course Outcomes:

1. Analyze syntax-related concepts including context-free grammars, parse trees, recursive-descent parsing, printing, and interpretation.
2. Interpret semantic issues associated with function implementations, including variable binding, scoping rules, parameter passing, and exception handling.
3. Design issues of object-oriented and functional languages.
4. Inspect language abstraction constructs of classes, interfaces, packages, and procedures.

ME 172: Computer Programming Language Sessional

3.0 Contact Hour; 1.50 Credit Hour; Pre-requisite: None

Text and Ref Books:

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

Course Objectives:

1. The course is designed to provide complete knowledge of C language.
2. Students will be able to develop logics which will help them to create programs, applications in C.
3. Learning the basic programming constructs, they can easily switch over to any other language in future.

Course Synopsis:

As a fundamental subject, this course equips the students with theory and practice on problem solving techniques by using the structured approach. Students are required to develop programs using C programming language, in order to solve simple to moderate problems. The course covers the following: preprocessor directives, constants and variables, data types, input and output statements, text files, control structures: sequential, selection and loop. It may also include arrays and basic library functions.

Course Outcomes:

1. Solve problems systematically using a structured logic approach.
2. Construct a C program correctly from the analyzed problems using structured approach.
3. Construct or develop complete C programs for simple to moderate problems individually.

Shop 162: Workshop Technology Sessional

3.0 Contact Hour; 1.50 Credit Hour

Text and Ref books:

1. Machine Shop Practice – James Anderson, W. A. Chapman.
2. Callister W. D., Material Science & Engineering, John Wiley & Sons.

Course Objectives:

1. The student will be able to use different manufacturing (machining, welding, foundry, sheet metal working, etc.) processes required to manufacture a product from the raw materials.
2. He will be able to use different measuring, marking, cutting tools used in workshop.
3. He will be aware of the safety precautions while working in workshop.

Course Synopsis:

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, aluminum; 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.

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.

Course Outcomes:

1. Study the basics of workshop engineering practice.
2. Identify the hand tools and instruments and acquire measuring skills.
3. Acquire practical skills by performing the experiments in different shops of workshop.

ME 203: Engineering Thermodynamics

3.00 Contact Hour; 3.00 Credit Hour; Pre-requisite: None

Text and Ref Books:

1. Thermodynamics: An Engineering Approach - Yunus A. Cengel, Michael A. Boles
2. Fundamentals of Engineering Thermodynamics- Michael J. Moran &Howard N. Shapiro.
3. Fundamentals of Thermodynamics – R E Sonntag, C. Borgnakke, G J. Van Wylen.

Course Objectives:

1. This course provides an introduction to the essential theoretical basis of engineering thermodynamics and its application to a range of problems of relevance to practical engineering.
2. The course aims to equip you with basic tools and methodologies for carrying out thermodynamic analyses of engineering systems.

Course Synopsis:

Fundamental concepts; Energy, energy transfer and first law of thermodynamics, Properties of pure substances; Energy analysis of control mass and control volume system; Second law of thermodynamics; Entropy and exergy analysis; Thermodynamics relations; Carnot cycle; Gas power cycles; Ideal cycles; Otto cycles, diesel cycle, Brayton cycle; Vapor power cycle; Refrigeration cycle; Mixture of gases and vapors; Psychrometry.

Course Outcomes:

1. Apply understanding of the nature and operating principles of energy flows to systems encountered in engineering.
2. Describe basic thermodynamic principles and laws of physics to analyzing and predicting performance of idealized forms of thermodynamic systems.
3. Assess benefits of improvements to thermodynamic systems.
4. Relate idealized thermodynamic system models to corresponding real systems.

ME 204: Engineering Thermodynamics Sessional

1.50 Contact Hour; 0.75 Credit Hour

Text and Ref Books:

1. Thermodynamics: An Engineering Approach - Yunus A. Cengel, Michael A. Boles
2. Fundamentals of Engineering Thermodynamics- Michael J. Moran &Howard N. Shapiro.
3. Fundamentals of Thermodynamics – R E Sonntag, C. Borgnakke, G J. Van Wylen.

Course Objectives:

1. Apply thermodynamic laws and principles to the analysis of processes, cycles and thermodynamic hardware
2. Explain and investigate the laws and principles of thermodynamics and use to solve problems
3. Solve thermodynamics problems by appraising given information, determining which concepts apply, and then provide and verify an appropriate solution
4. Communicate results through reports, sketching, and modelling

Course Synopsis:

Thermodynamics sessional deals with the relations between heat and other forms of energy such as mechanical, electrical, or chemical energy. Given that mechanical engineering systems are based on energy exchange; you must be well grounded in the relationships that determine these exchanges. In this course, you will learn and apply a range of thermodynamic laws and principles so that you can analyze a given thermodynamic problem (such as the combustion of fuels to release heat and energy, and the translation of this release of energy into movement) and discuss operational features of various thermodynamic systems and components.

Course Outcomes:

1. Explain fundamental concepts relevant to thermodynamics through experiments.
2. Explain the concepts of work, power, and heat in thermodynamics; determine work and heat sign conventions; determine work involved with moving boundary systems (graphical and analytical methods).
3. Explain the first law of thermodynamics for a closed system.
4. Perform energy analysis of refrigeration and heat pump thermodynamic cycles.
5. Determine thermodynamic properties of pure substances.
6. Apply the first law of thermodynamics for a control volume, including with turbines, compressors, nozzles, diffusers, heat exchangers, and throttling devices.

7. Explain the second law of thermodynamics, including why it is necessary, how it is defined (Kelvin-Planck and Clausius), the nature of irreversibility, and the Carnot cycle.
8. Explain the concept of entropy, including the Clausius Inequality, using thermodynamic tables, setting up entropy balances, and calculating isentropic efficiency of pumps, compressors, turbines, and heat exchangers.

ME 243: Mechanics of Solids

3.00 Contact Hour; 3.00 Credit Hour; Pre-requisite: ME 245

Text and Ref Books:

1. Strength of materials (4th edition) William Nash, Publisher Mcgraw-hill International Editions, Schaum's Outline Series.
2. Mechanics of material with solved problems A C Mandal & M. Quamrul Islam, published by IUT, OIC, 2011.
3. Strength of Materials (4th edition) – Andrew Pytel, Ferdinand L. Singer.
4. Strength of Materials – Beer and Johnston.
5. Strength of Materials – E. P. Popov.

Course Objectives:

This course introduces to the calculations concerned with the mechanical properties of materials as they relate to the strength and stability of structures and mechanical components, and the skills and knowledge required to develop analytical techniques used to solve a wide range of linear stress/strain problems.

Course Synopsis:

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.

Course Outcomes:

1. Describe the concepts and principles, and perform calculations, relative to the strength and stability of structures and mechanical components.
2. Define the characteristics and calculate the magnitude of combined stresses in individual members and complete structures.
3. Analysis various situations involving structural members subjected to combined stresses by application of Mohr's circle of stress.
4. Calculate the deflection at any point on a beam subjected to a combination of loads.
5. Find solutions of non-linear equations using bisection method, Newton's methods and secant method and implement using a computer.
6. Construct graphical displays of science/engineering data and interpret the role of such displays in data analysis.

ME 244: Mechanics of Solids Sessional

1.50 Contact Hour; 0.75 Credit Hour; Pre-requisite: ME 243

Text and Ref Books:

1. Strength of materials (4th edition) William Nash, Publisher Mcgraw-hill International Editions, Schaum's Outline Series.
2. Mechanics of material with solved problems A C Mandal & M. Quamrul Islam 2011.
3. Strength of Materials (4th edition) – Andrew Pytel, Ferdinand L. Singer.

4. Strength of Materials – Beer and Johnston.
5. Strength of Materials – E. P. Popov.
6. Mechanics of Solids Laboratory Practice- A.C. Mandal & M.Q. Islam

Course Objectives:

1. Instill a basic knowledge of the statistical aspects of mechanics of materials**.**
2. Develop the formal theory of solid mechanics: the equilibrium, kinematic, and constitutive equations**.**
3. Introduce the atomistic mechanisms underlying the mechanical behavior of materials.
4. Establish process - structure - property - performance relationships in materials engineering.

Course Synopsis:

This is the foundation unit in the study of structures. By applying the knowledge gained in Statics and combining it with the concepts gained in Materials Technology the students are introduced to fundamental theories and techniques required to analyze the state of stress and strain in structural members subjected to external loads.This knowledge will allow students to perform the engineering calculations required to ensure that a structural member meets strength, stiffness and stability requirements.

Course Outcomes:

1. Recognize the fundamentals of Solid Mechanics.
2. Demonstrate the fundamentals of stresses and strains.
3. Identify and express the principles of Solid Mechanics in obtaining the solutions for applications in real life engineering problems.
4. Identify and express the principles of Solid Mechanics in obtaining the solutions for applications in real life engineering problems.
5. Create and Develop “engineers’ eyes”.

ME 245: Engineering Mechanics-I

3.00 Contact Hour; 3.00 Credit Hour; Pre-requisite: None

Text and Ref Books:

1. Vector Mechanics for Engineers: Statics–Ferdinand P. Beer,E RussellJr. Johnston, Publisher – McGraw-Hill Companies, 5th edition 1988.
2. Engineering Mechanics, Statics and Dynamics: Joseph FShelley,Publisher–McGraw-Hill,1980.
3. Engineering Mechanics Statics – R.C. Hibbeler.

Course Objectives:

1. This course provides an introduction to the essential theoretical basis of Engineering Mechanics and its application to a range of problems of relevance to practical engineering.
2. This course uses the Laws of Mechanics to predict forces in and motions of machines and structures.
3. This course will help to understand the courses dealing with mechanics of machines, stress analysis and design of mechanical systems.

Course Synopsis:

Basic concepts of mechanics; Statics of particles and rigid bodies; Centroids of lines, areas and volumes; Forces in truss, frames, and machines; Forces in cables; Friction; Power transmission by belts and ropes; Moments of inertia of areas and masses; Method of virtual work.

Course Outcomes:

1. Determine the components of a force in rectangular or nonrectangular coordinates.
2. Demonstrate complete and correct free-body diagrams and write the appropriate equilibrium equations from the free-body diagram.
3. Analyze systems that include frictional forces.
4. Calculate the second moment of an area, calculate the principal second moments of an area.

ME 247: Engineering Mechanics-II

3.00 Contact Hour; 3.00 Credit Hour; Pre-requisite: None

Text and Ref Books:

1. Vector Mechanics for Engineers: Dynamics – Ferdinand P. Beer, E Russell Jr. JohnstonEngineering Mechanics, Statics and Dynamics – Joseph F Shelley
2. Engineering Mechanics Dynamics – R.C. Hibbeler.

Course Objectives:

1. In this course you will study the state of rest or motion of bodies under the action of a single or multiple force. Therefore, this course deals with Newton's Second Law of motion which is the foundation for the design and analysis of various structural, mechanical and electrical devices found in a wide range of engineering applications.
2. You will study the kinematics and kinetics of particles and rigid bodies using force and acceleration, work and energy, and impulse and momentum principles.

Course Synopsis:

Kinematics of particles; Kinetics of particles: Newton's second law; energy and momentum method; System of particles; Kinematics of rigid bodies; Plane motion of rigid bodies: forces and acceleration; Energy and momentum methods; Velocity and acceleration in mechanism.

Course Outcomes:

1. Use scalar and vector analytical techniques for analyzing forces and moments in mechanical systems.
2. Apply fundamental concepts of kinematics and kinetics of particles and rigid bodies to the analysis of simple, practical problems.
3. Apply basic knowledge of math and physics to solve real-world problems.

ME 260: Mechanical Engineering Drawing –II

3.00 Contact Hour; 1.50 Credit Hour; Pre-requisite: ME 160

Text and Ref books:

1. Metric Drafting – Paul Wallah,
2. Drafting Technology and Practice – William P. Spence
3. Technical Drawing – Frederick E Giesecke, Alva Mitchell, Henry C. Spencer

Course Objectives:

1. Gaining a working knowledge of CAD solid modeling (SolidWorks).
2. Theoretical concepts of engineering graphics, including orthographic projection, auxiliary views and sectioning, general dimensioning and tolerance, and geometric dimensioning and tolerance.

Course Synopsis:

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 3D drawing commands and drafting of 3D drawings on computer.

Course Outcomes:

1. Demonstrate competency with multiple drawing and modification commands in SolidWorks.
2. Create three-dimensional solid models.
3. Create three-dimensional assemblies incorporating multiple solid models.
4. Apply industry standards in the preparation of technical mechanical drawings.

ME 293: Engineering Materials

3.00 Contact Hour; 3.00 Credit Hour; Pre-requisite: None

Text and Ref Books:

1. Chemistry of Engineering Materials (4th edition) – Robert B. Leighou, Publisher – Mc Graw-Hill Inc.
2. Introduction to Physical Metallurgy (2nd edition) Sidney H Avner, Publisher –Tata Mc Graw – Hill Edition.
3. Engineering Metallurgy (Part I & II) (6th 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 (4th edition) 1997.
5. Introduction to Materials Science for Engineering – Shackleford.
6. Introduction to Physical Metallurgy – S F Avner, Publisher – Mc Graw Hill (2nd edition).
7. Physical Metallurgy for Engineers – D S Clarke and W B Verney.

Course Objectives:

1. This course introduces various engineering materials including metals, composites, plastics, adhesives and recognizing the process used to construct objects from these materials and the external factors that can change the effectiveness of these materials.
2. The course aims to equip you with basic tools and methodologies for carrying out materials of engineering systems.

Course Synopsis:

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 allow 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.

Course Outcomes:

1. Explain the differences in the mechanical behavior of engineering materials based upon bond type, structure, composition, and processing.
2. Describe the basic structures and repeat units for common thermoplastics and relate the distribution of molecular weights, degree of polymerization, percent crystallinity, and glass transition temperature to properties in service.
3. Apply ethical principles, engineering codes of ethics, and professional responsibilities in the selection of materials in engineering design.
4. Use binary phase diagrams to predict microstructures and also to understand precipitation hardening.

ME 294: Engineering Materials Sessional

1.50 Contact Hour; 0.75 Credit Hour; Pre-requisite: None

Text and Ref Books:

1. Chemistry of Engineering Materials (4th edition) – Robert B. Leighou, Publisher – Mc Graw-Hill Inc.
2. Introduction to Physical Metallurgy (2nd edition) Sidney H Avner, Publisher –Tata Mc Graw – Hill Edition.
3. Engineering Metallurgy (Part I & II) (6th edition) – Raymond A. Huggins, Publisher – Viva Books Private Ltd.

Course Objectives:

1. To develop an understanding among students about the basic concepts of Metallic Materials.
2. To provide initial Training in the Metallurgical Microscope.
3. The course aims to develop the basic concepts on study of phase diagrams and micro study of cast irons

Course Synopsis:

Introduction to metallographic and Metallographic sample specimen preparation. Study of Phase diagrams, Microstudy of steel, Heat treatment of steels, Micro study of cast irons.

Course Outcomes:

On successful completion of this course students will be able to

1. Explain the differences in the mechanical behavior of engineering materials based upon bond type, structure, composition, and processing.
2. Describe the basic structures and repeat units for common thermoplastics and relate the distribution of molecular weights, degree of polymerization, percent crystallinity, and glass transition temperature to properties in service.
3. Apply ethical principles, engineering codes of ethics, and professional responsibilities in the selection of materials in engineering design.
4. Use binary phase diagrams to predict microstructures and also to understand precipitation hardening.

ME 305: Heat and Mass transfer

4.00 Contact Hour; 4.00 Credit Hour; Pre-requisite ME 203

Text and Ref Books:

1. Heat and Mass Transfer, Fundamentals & Applications – Yunus A. Cengel, Afshin J. Ghajar.
2. Fundamental of Heat & Mass Transfer – Frank P. Incropera.
3. Heat Transfer – J. P. Holman
4. Principles of Heat Transfer – F. Kreith, Raj M Manglik, Mark S. Bohn
5. Heat Transfer: A Basic Approach – OZISIK
6. Advanced Convective Heat Transfer – Adrian Bejan

Course Objectives:

1. The course provides an introduction to heat and mass transfer and introduces practical application in industry.
2. Basic tools to design process operations involving heat transfer and mass transfer are covered.
3. Extensive use is made of industrial examples and analogies between the various transport mechanisms to encourage lateral thinking.

Course Synopsis:

Basic modes of heat transfer; General conduction equation; Steady State conduction in different geometries and composite structures; Thermal contact resistance; Unsteady heat conduction in solids; Laws of radiation heat transfer; Radiation shape factor; radiation interchange between two surfaces; Gas radiation; Heat and momentum transfer associated with laminar and turbulent flows of fluids in forced convection; Velocity and thermal boundary layer developments over flat plate and through tubes (ducts); Natural convection heat transfer; Heat transfer mechanism with change of phase; Boiling and condensation; mechanism and heat transfer correlations; Mechanism of mass transfer by diffusion; convection and change of phase; Analogy between heat and mass transfer.

Course Outcomes:

1. Apply principles of heat and mass transfer to basic engineering systems.
2. Analyze heat transfer by conduction, convection and radiation.
3. Describe analytical and numerical methods commonly used to analyze two-dimensional, steady state heat conduction.
4. Analyze and calculate heat and mass transfer in complex systems involving several heat transfer mechanisms.

ME 306: Heat and Mass Transfer Sessional

1.50 Contact Hour; 0.75 Credit Hour; Pre-requisite None

Text and Ref Books:

1. Fundamental of Heat & Mass Transfer - Incropera.
2. Principles of Heat Transfer – F. Kreith, (7th edition), M. S. Bohn.
3. Heat Transfer – J. P. Holman 7e.
4. Heat and Mass Transfer, Fundamentals & Applications – Yunus A. Cengel, Afshin J. Ghajar.
5. Heat Transfer Laboratory Practice- A.C. Mandal & M.Q. Islam

Course Objectives:

1. The course provides an introduction to heat and mass transfer and introduces practical application in industry.
2. Basic tools to design process operations involving heat transfer and mass transfer are covered.

Course Synopsis:

This course is design of basics model 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; Effective of variable thermal conductivity; Analysis of heat conduction system with heat sources and heat transfer from finned surfaces, study of free convection, natural radiation, light radiation.

Course Outcomes:

1. Apply principles of heat and mass transfer to basic engineering systems
2. Analyze heat transfer by conduction, convection and radiation
3. Describe analytical and numerical methods commonly used to analyze two-dimensional, steady state heat conduction.
4. Analyze and calculate heat and mass transfer in complex systems involving several heat transfer mechanisms.

ME 307: Heat Transfer Equipment Design

3.00 Contact Hour; 3.00 Credit Hour; Pre-requisite ME 305

Text and Ref Books:

1. Heat & Mass Transfer: A Practical Approach- Yungus A. Cengel.
2. Fundamental of Heat & Mass Transfer-by Incropera.
3. Principles of Heat Transfer – F. Kreith, (7th edition), M. S. Bohn.
4. Heat Transfer – J. P. Holman 7e.
5. Heat Transfer: A Basic Approach – OZISIK.
6. Advanced Convective Heat Transfer – Adrian Bejan.

Course Objectives:

1. This course provides an introduction to the essential theoretical basis of heat transfer equipment design and its application to a range of problems of relevance to practical engineering.
2. The course aims to equip you with basic tools and methodologies for carrying out heat transfer analysis in many engineering devices.

Course Synopsis:

Concept of thermal system design: Heat transfer requirements: Mechanical design: Design parameters: Materials, cost and economics: Safety and reliability: Choice and availability; Optimization: Cyclic service. Heat transfer from finned surface: Basic fin design, Types of fins: Fin performance, Efficiency of fins, Equation of heat transfer from fins, Analysis of unsteady heat conduction. Basic thermal design methods of heat exchangers: Types of heat

exchangers; Parallel flow, counter flow, cross flow, shell-and-tube, mixed and unmixed, single and multiple pass, compact heat exchangers: Thermo fluid characteristics: Sizing of heat exchangers; Fouling of heat exchangers: Performance of heat transfer equipment; Log mean temperature difference, Effectiveness-NTU; F correction factor. Two phase heat transfer equipment: Boiler, Evaporator, Condenser, Cooling tower. Thermal systems with internal heat source: Modeling of thermal equipment.

Course Outcomes:

1. Describe various types of heat transfer process and associated devices.
2. Analyze and select the heat transfer device.
3. Interpret design parameters, cost estimation and optimization from engineering point of view.
4. Apply multiphase heat transfer equipment design.

ME 321: Fluid Mechanics-I

3.00 Contact Hour; 3.00 Credit Hour; Pre-requisite: None

Text and Ref Books:

1. Fluid Mechanics-1, Victor, L. Streeter.
2. Fluid Mechanics: Fundamentals and Applications by Yunus A. Cengel, John Cimbala.
3. Mechanics of Fluids by Irving Herman Shames.
4. Fluid Mechanics Through Worked out Problems- A.C. Mandal & M.Q. Islam

Course Objectives:

1. This course provides an introduction to the principles of fluid mechanics of mechanical systems.
2. The focus is to illustrate practical engineering applications of these principles in relation to simple fluid systems.
3. The learning approach is to apply engineering principles to performance analysis and prediction of simple fluid systems. This will provide a basis for understanding how performance can be improved. You will acquire an understanding of the essential theoretical basis of the fluid mechanic sciences and their application to a range of problems of relevance to practical engineering.

Course Synopsis:

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 in viscid incompressible flow to include two dimensional basic flows.

Course Outcomes:

1. Identify how properties of fluids change with temperature and their effect on pressure and fluid flow.
2. Define the relationship between pressure and elevation as it relates to manometers, barometers and other pressure measuring devices.
3. Calculate forces on a plane submerged in a static fluid.
4. Calculate buoyancy on a body submerged in a static fluid.

ME 322: Fluid Mechanics Sessional – I

1.50 Contact Hour; 0.75 Credit Hours; Pre-requisite: None

Text and Ref Books:

1. Fluid Mechanics-1, Victor, L. Streeter.
2. Fluid Mechanics: Fundamentals and Applications by Yunus A. Cengel, John Cimbala.

3. Mechanics of Fluids by Irving Herman Shames.
4. Fluid Mechanics Laboratory Practice- A.C Mandal & M.Q. Islam

Course Objectives:

1. This course provides an introduction to the principles of fluid mechanics of mechanical systems.
2. The focus is to illustrate practical engineering applications of these principles in relation to simple fluid systems.
3. By the end of this course students should be able to understand the basic principles and analysis of both static and dynamic fluid systems

Course Synopsis:

Hydrostatic Pressure measurement, Bernoulli's Theorem Study, Calibration of Rectangular Notch and V notch, Study of Stability of a Floating Body, Development of air flow in pipe apparatus.

Course Outcomes:

On successful completion of this course students will be able to

1. Devise simple solutions to a range of problems in basic fluid flows
2. Undertake basic design calculations of fluid engineering systems

ME 323: Fluid Mechanics – II

3.00 Contact Hour; 3.00 Credit Hour; Pre-requisite: ME 321

Text and Ref Books:

1. Fluid Mechanics with Engineering Applications–Robert L. Daugherty, Joseph B. Franzini, E. John.
2. Fluid Mechanics–Frank M. White.
3. Fluid Mechanics Through Worked out Problems- A.C. Mandal & M.Q. Islam

Course Objectives:

1. This course develops on the thermodynamic and fluid mechanics principles introduced in ME 321.
2. This includes the calculations necessary to evaluate and design fluid engineering systems.

Course Synopsis:

Dimensional analysis and similitude; Fundamental relations of compressible flow; Speed of sound wave; Stagnation states for the flow of and 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.

Course Outcomes:

1. Distinguish the types of flows and determine sonic velocity in a fluid.
2. Add the frictional losses in a pipeline system that contains different pipe sizes and fittings.
3. Use the general energy equation to calculate changes in fluid flow for circular and non-circular pipes for in-compressible fluids.
4. Optimize real mechanical systems using corresponding idealized fluid system models.

ME 324: Fluid Mechanics Sessional –II

1.50 Contact Hour; 0.75 Credit Hour; Pre-requisite: None

Text and Ref Books:

1. Fluid Mechanics-1, Victor, L. Streeter.
2. Fluid Mechanics: Fundamentals and Applications by Yunus A. Cengel, John Cimbala.
3. Mechanics of Fluids by Irving Herman Shames.

4. Fluid Mechanics – Frank M. White
5. Fluid Mechanics through worked out problems- By Md. Quamrul Islam & A.C Mondal.

Course Objectives:

1. This course provides an introduction to the principles of fluid mechanics of mechanical systems.
2. The focus is to illustrate practical engineering applications of these principles in relation to simple fluid systems.
3. By the end of this course students should be able to understand the basic principles and analysis of both static and dynamic fluid systems.

Course Synopsis:

Open Channel Flow using different cross section and hydraulic jump, Study of flow through Orifice meter and Venturi meter, Determination of head loss due to pipe friction, Performance test of a centrifugal pumps connected in series and parallel condition

Course Outcomes:

On successful completion of this course students will be able to

1. Devise simple solutions to a range of problems in basic fluid flows.
2. Undertake basic design calculations of fluid engineering systems.

ME 333: Manufacturing Technology

4.00 Contact Hour; 4.00 Credit Hour; Pre-requisite: None

Text and Ref Books:

1. Manufacturing Engineering and Technology(4thedition)–Serope Kalpakjiann StevenR. Schmid, Publisher – Prentice Hall, 4th edition, 2004.
2. "Principles of Modern Manufacturing, 5th Edition, SI Version 2013", Authors: Mikell P. Groover, Publisher: John Wiley & Sons, Inc
3. Manufacturing Processes and Materials for Engineers – Doyle Morris.
4. Introduction to Manufacturing Process – John A. Schey, Publisher – Mc Graw-Hill, 1999.

Course Objectives:

1. Manufacturing Process Overview
2. Production Processes: Machine and process overviews
3. Introduction to Plastic, ceramic and glass product manufacturing processes.
4. Control charts, X, R and C charts; Regression analysis; Analysis of variance; Concept of quality circle, TQM and TQC.

Course Synopsis:

Manufacturing Process Overview: Product concepts, Market feasibility, Engineering design, Prototyping.

Production Processes: Machine and process overviews, Finishing, Assembly. Production Machine Operations: Presses, Molding/Casting, Drilling/Boring, Machining, Welding, Finishing, Advanced Intelligence Automation, Programmable Logic Controllers.

Types of motions in machining, turning and Boring, Shaping, Planning and Slotting, Thread cutting, Drilling and reaming, Milling, Broaching, Gear cutting and Grinding, Machining parameters and related quantities.

Introduction to Plastic, ceramic and glass product manufacturing processes.

Machine Tools: Introduction, Classification, construction and specifications of lathe, drilling machine, milling machine, boring machine, broaching machine, shaper machine, planer machine, grinding machine, CNC machines. Part programming fundamentals, Introduction to digital manufacturing and digital manufacturing science.

Cutting Tool Materials, Geometry and Surface Finish, Effect of machining parameters on surface finish. Machining equations for cutting operations. Mechanics of Machining Processes, Tool Wear, Tool Life.

Control charts, X, R and C charts; Regression analysis; Analysis of variance; Concept of quality circle, TQM and TQC.

Course Outcomes:

1. Recommend appropriate part manufacturing processes when provided a set of functional requirements and product development constraints.
2. Develop engineering knowledge of manufacturing process of various materials.
3. Develop thorough engineering sense of various machines and machining operations related to manufacturing products.
4. Describe economic performance and quality analysis of various manufacturing products.

ME 334: Manufacturing Technology Sessional

1.50 Contact Hour; 0.75 Credit Hour; Pre-requisite: None

Text and Ref Books:

1. Manufacturing Engineering and Technology (4th edition) – Serope Kalpakjiann Steven R. Schmid,
2. "Principles of Modern Manufacturing, 5th Edition, SI Version 2013", Authors: Mikell P. Groover,
3. Manufacturing Processes and Materials for Engineers – Doyle Morris
4. Education Quality Control and Management- Dr. M.A.A Hasin.

Course Objectives:

1. Manufacturing Process Overview: Product concepts, Market feasibility, Engineering design, Prototyping.

2. Production Processes: Machine and process overviews, Finishing, Assembly. Production Machine Operations: Presses, Molding/Casting, Drilling/Boring, Machining, Welding, Finishing, Advanced Intelligence Automation, Programmable Logic Controllers.

Course Synopsis:

Study of different types of chip and determination of chip Reduction coefficient, Determination of tool Study of CNC milling machine, Bending Machine. Gear cutting on a column & Knee type milling machine. Manufacturing of an industrial part by using Lathe & Shaper Machine.

Course Outcomes:

On successful completion of this course students will be able to

1. Recommend appropriate part manufacturing processes when provided a set of functional requirements and product development constraints
2. Develop engineering knowledge of manufacturing process of various materials
3. Develop thorough engineering sense of various machines and machining operations related to manufacturing products
4. Describe economic performance and quality analysis of various manufacturing products

ME 341: Machine Design –I

3.00 Contact Hour; 3.00 Credit Hour; Pre-requisite: ME 247

Text and Ref Books:

1. Shigley, JE & Mischke, CR, Mechanical Engineering Design, McGraw-Hill, 1989.
2. Khurmi, R. S., A Textbook of Machine Design, S Chand, 2005.

3. Mott, RL, Machine Elements in Mechanical Design, Maxwell Macmillan, 1992.
4. Pahl, G & Beitz, W, Engineering Design, Springer-Verlag, 1988.
5. Singh, K, Mechanical Design Principles, Nantel Publications, Melbourne, 1996.
6. Juvinall, RC & Marshek, KM, Fundamentals of Machine Component Design, 3rd edn, Wiley, 2000.

Course Objectives:

1. Machine Design is becoming the most acceptable subject among engineers. Customers are expecting products of high quality and reliability.
2. Knowledge of Machine Design is critical for any engineer specially for Mechanical Engineers involved in the design of mechanical components, machineries and its layouts for manufacturing purposes.

Course Synopsis:

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.

Course Outcomes:

1. Develop skills in the art of machine component design through design assignments.
2. Develop the ability to perform design analysis with sufficient depth to enable innovation.
3. Demonstrate the ability to creatively design quality products for a sustainable environment.
4. Build team skills through group projects.

ME 343: Machine Design-II

3.00 Contact Hour; 3.00 Credit Hour; Pre-requisite: ME 247

Text and Ref Books:

1. Mechanical Engineering Design – Joseph Edward Shigley, Charles R. Mischke, Publisher Mc Graw-Hill, 1988.
2. Machine Design: An Integrated Approach – Robert L Norton, Publisher – Prentice Hall, 2nd edition, 2000.
3. Mechanical Design of Machine Elements and Machines, 2nd Edition by Jack A. Collins, Henry R. Busby, George H. Staab.
4. SCHAUM's Outline Series Theory and Problems of Machine Design by Allen S. Hall, Alfred R. Holowenko e Herman G. Laughlin, Â McGraw-Hill.
5. A Textbook of Machine Design by R.S. KHURMI AND J.K. GUPTA, 14th Edn.
6. Fundamentals of Machine Design by Robert C. Juvinall, Kurt M. Marshek, Wiley.

Course Objectives:

1. This course provides an introduction to the essential theoretical basis of heat transfer equipment design and its application to a range of problems of relevance to practical engineering.
2. The course aims to equip you with basic tools and methodologies for carrying out heat transfer analysis in many engineering devices.

Course Synopsis:

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

Course Outcomes:

1. Understand the underpinning natural and physical sciences of designing various mechanical objects.
2. Analyze the influence of various parameters on designing a mechanical device.
3. Evaluate parameters and capability of designing mechanical devices using engineering tools and logic.

ME 345: Mechanics of Machinery

3.00 Contact Hour; 3.00 Credit Hour; Pre-requisite: ME 247

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) 2nd edition (SI units) – John Hannah and R. C. Stephens.
3. Theory of Machines – Thomas Bevan.

Course Objectives:

1. In this course you will study advanced concepts of kinematic and dynamic modeling and analysis of mechanisms and machines, including linkage mechanisms and cam mechanisms, reciprocating and rotating machinery.
2. The course enables you to explore in depth core mechanical engineering concepts by integrating and applying contemporary analytical, computational and experimental methods. It relates kinematics and dynamics of mechanisms and machines to their design and allows you to relate theory and practice using a problem-based approach in which you develop project management skills.

Course Synopsis:

Mechanisms; 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.

Types of Vibration: Longitudinal, transverse and torsional vibrations; Undamped free vibrations with one and two degrees of freedom; Damped free and forced vibrations with single degrees of freedom; Whirling of shafts and rotors; Vibration of geared systems; Vibration absorption, isolation and deisolation, Vibration measuring instruments.

Study of cams and cam followers; Clutches and brakes; Dynamometers; Study of gears and gear trains; Gyroscope; Principles and applications.

Course Outcomes:

1. Relate basic concepts/principles of work-energy methods and impulse and momentum principles to the solving of engineering problems.
2. Explain the kinetics of particles or rigid bodies moving with planar motion.
3. Analyze and solve engineering problems relating to the dynamic behavior of vibrating single-degree and two-degrees of freedom, undamped and damped systems.
4. Relate basic principles to applications of vibration transducers / accelerometers.

ME 346: Mechanics of Machinery Sessional

1.50 Contact Hour; 0.75 Credit Hour; Pre-requisite: None

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) 2nd edition (SI units) – John Hannah and R. C. Stephens.
3. Theory of Machines – Thomas Bevan

Course Objectives:

1. This course will make one capable of applying the advanced concepts of kinematics and dynamics in real life problems including linkage mechanisms and cam mechanisms, reciprocating and rotating machinery etc.

2. This course will provide students with the skills, knowledge required to describe and analyse the effects of forces on the motion of particles, rigid bodies and vibrating systems, in order to predict dynamic behaviour as a basis for engineering design.
3. This will provide students with in depth practical knowledge and skills within specialist sub-disciplines of the practice area.

Course Synopsis:

Mechanisms; 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.

Types of Vibration: Longitudinal, transverse and torsional vibrations; Undamped free vibrations with one and two degrees of freedom; Damped free and forced vibrations with single degrees of freedom; Whirling of shafts and rotors; Vibration of geared systems; Vibration absorption, isolation and deisolation, Vibration measuring instruments.

Study of cams and cam followers; Clutches and brakes; Dynamometers; Study of gears and gear trains; Gyroscope; Principles and applications.

Course Outcomes:

Upon successful completion of this course you will be able to:

1. Relate basic concepts/principles of work-energy methods and impulse and momentum principles to the solving of engineering problems.
2. Explain the kinetics of particles or rigid bodies moving with planar motion.
3. Analyze and solve engineering problems relating to the dynamic behavior of vibrating single-degree and two-degrees of freedom, undamped and damped systems.
4. Relate basic principles to applications of vibration transducers / accelerometers.

ME 361: Instrumentation and Measurement

3.00 Contact Hour; 3.00 Credit Hour; Pre-requisite: None

Text and Ref Books:

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

Course Objectives:

1. This course provides an introduction to the principles, techniques, equipment and engineering practice of electronic testing as well as underlying instrumentation and measurement technology and tools.
2. The course is closely aligned with current industrial needs.
3. The course develops appreciation of the modern test technology that plays key role in ensuring quality and functionality of the modern high complexity devices and systems. It builds up important skills in the area of practical instrumentation in industrial and research settings with the use of modern modular hardware for measurement and automation combining with open graphical programming software.

Course Synopsis:

Basic principles of measurements; Characterization and behavior 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.

Course Outcomes:

1. Design-for-Test and Built-in self-test methodologies; Automatic Test Equipment architectures and operation

2. Reemphasize on the understanding of concepts and applications of test technology.
3. Implement prototype test systems for the given semiconductor devices using specified instrumentation and measurement tools.

ME 363: Numerical Analysis

3.00 Contact Hour; 3.00 Credit Hour; Pre-requisite: None

Text and Ref Books:

1. Numerical Methods for Engineers (4th edition) – Steven C. Chapra, Raymond P. Carale,
2. Applied Numerical Analysis (5th edition) – Curtis F. Gerald, Patrick O. wheatley
3. Numerical Methods: Using Matlab, Fourth Edition, 2004 John H. Mathews and Kurtis D. Fink
4. Numerical Methods – E. Balagurusamy

Course Objectives:

1. This course will emphasize the development of numerical algorithms to provide solutions to common problems formulated in science and engineering.
2. The primary objective of the course is to develop the basic understanding of the construction of numerical algorithms, and perhaps more importantly, the applicability and limits of their appropriate use.

Course Synopsis:

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.

Course Outcomes:

1. Find solutions of non-linear equations using bisection method, Newton's methods and secant method and implement using a computer.
2. Construct graphical displays of science/engineering data and interpret the role of such displays in data analysis.
3. Apply basic statistical inference techniques, including confidence intervals, hypothesis testing and analysis of variance, to science/engineering problems.

Employ appropriate regression models to determine statistical relationships.

ME 364: Numerical Analysis Sessional

3.0 Contact Hour 1.50 Credit Hour

Text and Ref books:

1. Applied Numerical Analysis (5th edition) – Curtis F. Gerald, Patrick O. wheatley.
2. Numerical Methods for Engineers (4th edition) – Steven C. Chapra, Raymond P. Carale
3. Numerical Method : Using Matlab, Fourth Edition, 2004 John H. Mathews and Kurtis D. Fink

Course Objectives:

1. Understand the implications of digital number representation and digital arithmetic for computational science and engineering.
2. Develop and implement numerically stable and accurate algorithms for all the basic tasks of computational science and engineering.

Course Synopsis:

Numerical solution of problems in Engineering using MATLAB.

Course Outcomes:

1. Understand the fundamental principles of digital computing, including number representation and arithmetic operations.
2. Understand the linkage between accuracy, stability and convergence.
3. Perform error analysis for arithmetic operations.
4. Understand the propagation of errors through complex numerical algorithms.
5. Perform numerical stability analysis.

ME 366: Integrated Design Project-I & II

4.00+4.00 Contact Hour 2.00+2.00 Credit Hour

Course Overview:

The course is designed to allow students to showcase the skills and abilities which have been developed through previous studies and to give an extensive supervised experience of designing a project/system to fill a real need related to mechanical engineering. The hope and expectation is that this experience will prepare students well to take on professional responsibilities once they graduate. Students are encouraged to work in teams, but are individually assessed. Students are also exposed to the project management aspects of engineering projects. The course brings together and further enhances a range of generic skills such as teamwork, problem solving and communication. The project may include problem definition, design conceptualization, modeling, approximation techniques, optimization, prototyping and testing.

Course Outcomes:

1. Team dynamics.
2. Reflection on the design process and on your own professional development.
3. Proper assessment of client's needs.
4. Derivation of appropriate project requirements and evaluation criteria.
5. Development of conceptual solutions.
6. Proper analysis of available options and the selection of the most promising solution.
7. Detailed design, including the necessary engineering analysis.
8. Development of detailed engineering drawings of components.
9. Selection of suitable manufacturing methods.
10. Component and/or material procurement.
11. Prototype construction.
12. Prototype testing and evaluation.
13. Technical communication of results (verbal and written).

Resources:

Text Book: Product Design and Development - Karl Ulrich and Steven Eppinger

Consultation with Faculty: Students will have weekly meetings with supervisor.

Access to Laboratories: Students are encouraged to do project work in the laboratories on their own as required, along with equipment and safety permit.

Course Evaluation: Students will be evaluated in multiple ways in four main categories (the 4 Ps): Proposal, Process, Product and Presentation.

Proposal: Students must produce a proposal that is acceptable to themselves, to their client (if any), and supervisor, all of whom must sign off on it before students may officially submit.

Process: To do well in this course, students must be determined to work steadily. This is necessary not only because there are numerous milestones to meet and items to submit for evaluation, but because physical resources such as

technician and shop time are limited. Therefore, to explicitly encourage steady, focused work, part of student's mark will be based on their cumulative progress. Students are expected to put in 56 hr per term per team member.

Product: Students will be judged not only on the prototype itself, but also on the drawings and models that they make of it. Feedback will be solicited from client if any, which will be included in the overall evaluation.

Presentation: Students will present not only regarding final design, but generate numerous short reports and other documents along the way, for example, a discussion of the state of the art and relevant patent/scientific literature material, a technical analysis, a discussion of manufacturing options, a presentation of conceptual models, economic &/or ergonomic &/or ethical &/or social impact analysis, etc. There will also be marked design presentations, at least one per term.

End of Course Design Celebration: To celebrate the hard work and to show off student's capabilities, a formal project show will be organized at the end of the course after the exam period.

ME 368: Engineering Simulation Sessional

1.5 Contact Hour 0.75 Credit Hour

Course Objectives:

1. Characterize engineering systems in terms of their essential elements, purpose, parameters, constraints, performance requirements, sub-systems, interconnections and environmental context.
2. Engineering problem modelling and solving through the relationship between theoretical, mathematical, and computational modelling for predicting and optimizing performance and objective.
3. Mathematical modelling real world situations related to engineering systems development, prediction and evaluation of outcomes against design criteria.
4. Develop solutions and extract results from the information generated in the context of the engineering domain to assist engineering decision making.
5. Interpret the model and apply the results to resolve critical issues in a real world environment.
6. Develop different models to suit special characteristics of the system being modeled

Course Synopsis:

This course examines a variety of engineering system modelling and simulation methods, as well as numerical and computer based solution techniques utilized in industrial and engineering environments. Techniques for finding solutions to these systems include: graphical, algebraic, numerical, state space, simulation and computational processes. Case studies in industry and engineering applications are used to illustrate the techniques and modelling concepts. Examples of simulation and analysis methods will be related to the linear and non-linear, deterministic and non-deterministic systems.

Course Outcomes:

1. Model deterministic systems and differentiate between nonlinear and linear models.
2. Simulate linear and non-linear ordinary differential equations and deterministic systems.
3. Estimate and validate a model based upon input and output data.
4. Create a model prediction based upon new input and validate the output data.
5. Comprehend and apply advanced theory-based understanding of engineering fundamentals and specialist bodies of knowledge in the selected discipline area to predict the effect of engineering activities.
6. Apply underpinning natural, physical and engineering sciences, mathematics, statistics, computer and information sciences to engineering applications.

ME 372: Industrial Training (Sessional)**

06 Weeks duration 1.5 Credit Hour

Students will be attached at different organizations and will learn regarding function of different sections, production process, procurement and marketing, costing of the product, future planning and problem faced by the industry and their probable solution, maintenance of equipment etc.

** It will be conducted after final exam of Level-3 Term-II.

ME 400: Project and Thesis I & II

6.00 + 6.00 Contact Hour 3.00 + 3.00 Credit Hour

In this course, students are required to undertake a major project/thesis 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 the form of 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 Engine

3.00 Contact Hour; 3.00 Credit Hours; Pre-requisite: ME-203

Text and Ref Books:

1. Internal combustion Engine Fundamentals – John B. Heywood
2. Internal Combustion Engines (3rd edition) – Edward F. Obert
3. The Internal Combustion Engine Theory and Practice - C. F. Taylor

Course Objectives:

1. To analyze the approach to the engineering problem and performance analysis of internal combustion engine
2. To study of thermodynamics, combustion, heat transfer, friction, and other factors affecting engine power, efficiency, and emissions.
3. To design and operate the characteristics of different types of engines. Computer assignments.

Course Synopsis:

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

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

Course Outcomes:

1. Design modern internal combustion engines and differentiate among different kinds of them.
2. Apply analytical techniques to the engineering problems and performance analysis of internal combustion engines.
3. Identify the thermodynamics, combustion, heat transfer, friction and other factors affecting engine power, efficiency and emissions.
4. Introduce environmental and fuel economy challenges facing the internal combustion engine along with future internal combustion engine technology and market trends.
5. Analyze combustion process, predict concentrations of primary exhaust pollutants.

6. Develop an understanding of real-world engine design issues and an ability to optimize future engine designs for specific sets of constraints (fuel economy, performance, emissions).

ME-402: Heat Engine Sessional

1.50 Contact Hour; 0.75 Credit Hours; Pre-requisite: None

Text and Ref Books:

1. Internal combustion Engine Fundamentals – John B. Heywood
2. Internal Combustion Engines (3rd edition) – Edward F. Obert
3. The Internal Combustion Engine Theory and Practice - C. F. Taylor

Course Synopsis:

Foundation design of a different IC engines, related calculation and analysis.

Course Outcomes:

1. Students will be able to identify the properties of substances on property diagrams and obtain the data from property tables.
2. Students will be able to define energy transfer through mass, heat and work for closed and control volume system.
3. Students will be able to understand the basic concepts of heat engine such as temperature, pressure system, properties, process, state, cycles and equilibrium.

ME 403: Power Plant Engineering

3.00 Contact Hour; 3.00 Credit Hours; Pre-requisite: ME-203

Text and Ref Books:

1. Power Plant Engineering, Second Edition –by Nag P K , Publisher: Tata Mc Graw Hill Publishing Co Ltd Edition: 2001
2. A course in power plant Engineering (S I unit)-by ARORA Domkundwar, Dhanpat Rai & Co.
3. Power Plant Technology – M M. El-Wakil, Publisher – McGraw-Hill Book Company International, edition 1984.
4. Power Plant Engineering – Frederick T. Morse

Course Objectives:

1. To comprises a wide range of power engineering subjects
2. To focus on theoretical and practical training.
3. To equip with quality to design, operate and maintain the various parts of a power plant along with environmental safety associated with it.

Course Synopsis:

Sources of energy; Production of power; Comparison of different types of power plants, Survey of power plants in Bangladesh. 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: Factors affecting Performance of GT, Cycle analysis, GT Cooling; Thermal power plants: fuels, Combustion Equipment; Feed water treatment; Steam turbines: reheat, regenerative, superposed, binary and combined cycles. Condensers, evaporators and cooling towers, gas loop and water loop, steam piping and insulations. Combined Cycle Power Plant, IGCC. 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. Alternative Power Plant Technologies.

Course Outcomes:

1. Relate between advanced knowledge of thermodynamics and the key features of a power plant.
2. Implement thermodynamic cycles in practical and to investigate theoretical and actual efficiencies.
3. Operate and know the solutions to improve the energy efficiency of power plants.

4. Build knowledge of power plant equipment's and Environmental safety.

ME 404: Power Plant Engineering Sessional

1.5 Contact Hour 0.75 Credit Hour; Pre/Co-Requisite: None

Text and Ref books:

1. "Power Plant Engineering" by Derbal L F and Boston P G
2. "Power Plant Performance" by Gill A B
3. "Power Plant Engineering" by Nag

Course Objectives:

1. Basic knowledge of Different types of Power Plants, site selection criteria of each one of them.
2. Understanding of Thermal Power Plant Operation, turbine governing, different types of high pressure boilers including supercritical and supercharged boilers, Fluidized bed combustion systems.
3. Design of chimney in thermal power plants, knowledge of cooling tower operation, numerical on surface condenser design.
4. Basic knowledge of Different types of Nuclear power plants including Pressurized water reactor, Boiling water reactor, gas cooled reactor, liquid metal fast breeder reactor.
5. Understanding of Power Plant Economics, Energy Storage including compressed air energy and pumped hydro etc.
6. Discussing environmental and safety aspects of power plant operation.

Course Synopsis:

Rankine cycle – improvisations, Layout of modern coal power plant, Super Critical Boilers, FBC Boilers, Turbines, Condensers, Steam & Heat rate, Subsystems of thermal power plants – Fuel and ash handling, Draught system, Feed water treatment. Binary Cycles and Cogeneration systems. Otto, Diesel, Dual & Brayton Cycle – Analysis & Optimization. Components of Diesel and Gas Turbine power plants. Combined Cycle Power Plants. Integrated Gasifier based Combined Cycle systems.

Course Outcomes:

1. Select the suitability of site for a power plant.
2. Calculate performance of thermal power plant.
3. Propose ash handling, coal handling method in a thermal power plant.
4. Explain working principle of different types of nuclear power plant.
5. Calculate load factor, capacity factor, average load and peak load on a power plant.
6. Indicate safety aspects of power plants

ME 405: Refrigeration and Building Mechanical System

3.00 Contact Hour; 3.00 Credit Hours; Pre-requisite: None

Text and Ref Books:

1. Refrigeration and Air conditioning- by Ahmadul Ameen.Internal
2. Refrigeration and Air conditioning-by R.S Khurmi.
3. Modern Refrigeration and Air-conditioning–AD. Althause, C.H.Turnquist,A.F. Bracciano
4. Heating cooling of Building, Design for Efficiency–J.F.Kreidev,A.Raldl

Course Objectives:

1. To provide an introduction and comprehensive knowledge of refrigerating systems, large-scale equipment for food storage and preservation, and air-conditioning and air distribution equipment.

2. To solve such problems across a range of industrial sectors and within general society, as mechanical engineering is a diverse and challenging field where you will be responsible for designing, improving and building mechanical devices, systems and machines.

Course Synopsis:

Concept of refrigeration and its applications; Different refrigeration methods; Analysis of vapor 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 design methods; Air conditioning equipment; Application criteria; Control systems. Fire Hazards: Firefighting equipment; Vertical transportation, its system design, Escalators and moving ramps.

Course Outcomes:

1. Introduce HVAC technology, system designs and research, energy impacts and overall goals by applying knowledge of mathematics, science and engineering.
2. Develop understanding of the principles and practice of thermal comfort and generalized psychometrics of moist air and apply to HVAC processes.
3. Design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability.
4. Use the techniques, skills, and modern engineering tools necessary for engineering practice in case of energy efficient buildings and building energy systems.

ME 421: Fluid Machinery

3.00 Contact Hour; 3.00 Credit Hours; Pre-requisite: ME-323

Text and Ref Books:

1. Fluid Mechanics – J. F. Douglas, J. M. Gaesirek, J. A. S. Waffield.
2. Fluid Mechanics (including Hydraulic Machines) by Jain A.K
3. Hydraulic Machines – Dr. Md. Quamrul Islam

Course Objectives:

1. To provide participants with the skills, knowledge and attitudes required to apply Fluid Mechanics.
2. To study the principles to a variety of real-world engineering applications including simple flow networks and pump & turbine design.

Course Synopsis:

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 and selection of fluid machine.

Course Outcomes:

1. Understand the underpinning natural and physical sciences and the engineering fundamentals applicable to the practice area where the performance and design parameters for hydraulic machinery such as pumps and turbines is analyzed and specified.

2. Interpret Procedural-level understanding of the mathematics, numerical analysis, statistics, and computer and information sciences which underpin the practice area and Solve simple engineering problems involving Vortex flows and the effects of External (open) flows on bodies of various shapes.
3. Use Dimensional Analysis techniques to model hydrodynamic systems and hence predict their flow behavior along with in depth practical knowledge and skills within specialist sub-disciplines of the practice area.
4. Develop creative, innovative and pro-active demeanor.

ME-422: Fluid Machinery Sessional

1.5 Contact Hour; 0.75 Credit Hours; Pre-requisite: ME 323

Text and Ref Books:

1. Fluid Mechanics – J. F. Douglas, J. M. Gaesirek, J. A. S. Waffield.
2. Fluid Mechanics (including Hydraulic Machines) by Jain A.K

Course Synopsis:

Foundation design of a Propeller Turbine, Centrifugal Pump, Reciprocating Pump, Pump in series and parallel

Course Outcomes:

1. Students will be able to calculate and optimize operational parameters of hydraulic problems, systems and machines
2. Students will be able to explain the correlation between different operational parameters.
3. Students will be able to predict prototype analysis based on similitude and understand the pitfalls of modelling

ME 467: Automobile Engineering

3.00 Contact Hour; 3.00 Credit Hour; Pre/Co-Requisite: None

Text and Ref books:

1. Automotive Mechanics – W. H. Crouse I Donald L AnglinPublisher – Tata Mc Graw-Hill Education Private limited.
2. Automotive Technology – Jack ErjavecPublisher – Delmar Thomson Learning
3. Automobile Engineering Vol 1 and voI 2 – Dr. Kirpal Singh. Publisher – Standard Publishers Distributors

Course Objectives:

1. To introduce the essential theoretical basis of Automobile Engineering and its application to a range of problems of relevance to practical engineering
2. To explore new areas, create new avenues in the fields of research and development of technologies in the field of automobile engineering.

Course Synopsis:

Introduction to road vehicles; Components of automobile; Automotive engines: types and construction; Valve events; Knock, pre-ignition and post-ignition; 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; Resistance to vehicle motion; automotive transmission systems and power train; automotive safety; automotive body; Electrical systems; Environmental considerations.

Course Outcomes:

1. Understand the anatomy of the automobile in general.
2. Identify the location and importance of each part and specify the different parts of the automobile.
3. Interpret the functioning of the engine and its accessories, gear box, clutch, brakes, steering, axles and wheels and explain the working of these parts and explain Suspension, frame, springs and other connections, emissions, ignition, controls, electrical systems and ventilation.
4. Develop a strong base for understanding future developments in the automobile industry and understand the environmental implications of automobile emissions.

ME 468: Automobile Engineering Sessional

3.00 Contact Hour 1.50 Credit Hour; Pre/Co-Requisite: None

Text and Ref books:

1. Ganesan.V.Internal Combustion Engines, Tata-McGraw Hill Publishing Co., New Delhi, 1994.
2. Heldt.P.M.,High Speed Combustion Engines, Oxford IBH Publishing Co.,1985.
3. Maleev.V.M, Diesel Engine Operation and Maintenance, McGraw Hill, 1974.
4. Dicksee.C.B, Diesel Engines, Blackie & Son Ltd., London, 1964.

Course Objectives:

1. Penetrate deep into engine classification, construction and operation of IC engine
2. Understand the performance parameters and testing methodology
3. Understand the necessity of ignition system SI engines

Course Synopsis:

Students need to experiment based on various types of vehicles, working principle and mechanism of vehicles, different parts and their functions of a vehicle.

Course Outcomes:

1. Describe SI and CI engine system application in automobiles.
2. Differentiate the fuel dynamics of SI and CI engine and define the key terms.
3. Design the combustion chamber of diesel engines.

ME 481: Industrial Management

3.00 Contact Hour; 3.00 Credit Hour; Pre/Co-Requisite: None

Text and Ref books:

1. Marketing Management –Phillip T. Kotler &Kelvin Lane Keller
2. Total Quality Management- Dale H. Besterfield
3. The Toyota Way – Jeffrey Liker

Course Objectives:

1. To introduce some aspects of business management and business organization.
2. To identify the tools and techniques needed to lead any project to its intended conclusion. Topics include project plans, managing expectations and contingencies, building a winning team, gaining commitments, managing project risks, and development of personal skills critical to the successful project manager.
3. To introduce sales fundamentals include understanding the customer and the competition, sales strategy, sales management, product positioning, product life cycle, sales structures, margins, and prospecting for new customers.

Course Synopsis:

Organization and management: evolution, management functions, and organization structure; Development of organization theory; Total Quality Management, Lean manufacturing Tools.
Cost management elements of cost of products, cost centers 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.

Human Resource management: importance, scope, need hierarchy, motivation; Defense mechanism; Leadership; Group dynamics; Job evaluation and merit rating; hiring, training, wage systems.

Marketing management: Core marketing concept, Marketing organization; Advertising decisions; new product and pricing strategy, tapping into global market, Pricing Strategy. Introduction to PPC, Supply Chain Management, Case Study.

Course Outcomes:

1. Develop in depth idea on Industrial management and organization to perform the Management Functions
2. Compare between selected Theories of Management
3. Design Industrial plant and to perform the functions in the Marketing Mix
4. Develop knowledge of effective material management; Students will learn Management and resource allocation; Engineering economy and assessment on ethical issues in Business situations

ME 486: Engineering Research & Business Communication Sessional

1.5 Contact Hour 0.75 Credit Hour

Text and Ref books

1. Technical Communication- By Mike Markel.
2. Essentials of Technical Communication.
3. Technical Communication.
4. Gregg Reference Manual - Text Only.
5. Introduction to Group Work Practice.

Course Objectives:

The main objective of communication is to help managers in achieving organization goals. It helps managers to perform all managerial functions and to achieve predetermined goals. Objectives of business communication.

Course Synopsis:

Facing Today's Communication Challenges, writing for Business Audiences, Improving Writing Techniques, Revising and Proofreading Business Messages-Mail and Memorandums, Routine Letters and Goodwill Messages, Persuasive Messages, Negative Messages, Informal Reports, Proposals and Informal Reports

Course Outcomes:

1. Discuss the importance of effective communication in business Effective Communication in Business.
2. Differentiate between different methods of communication Methods of Communication.
3. Discuss the importance of ethical communication Ethics in Business Communication.
4. Discuss the importance of staying connected with colleagues, other professionals, and customers in the digital age Staying Connected.

5.2 ELECTIVE COURSES OFFERED

ME 407: Advanced Thermodynamics

3.00 Contact Hour; 3.00 Credit Hours; Pre-requisite: ME-203

Text and Ref Books:

1. Advanced thermodynamics for Engineers – K. Wax, Publisher – McGraw-Hill International
2. Winterbone, D. and Turan, A., Advanced Thermodynamics for Engineers, Butterworth-Heinemann.
3. Advanced Thermodynamics for Engineers, Wark. K, McGraw-Hill

Course Objectives:

1. To introduce classical and statistical viewpoints in thermodynamics; Concepts of equilibrium, stability, reversibility, irreversibility and availability;
2. To calculate the entropy changes; statistical interpretation; entropy of mixing; absolute entropy; entropy flow and entropy production
3. To introduce 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.

Course Synopsis:

This course provides an introduction to the essential theoretical basis of Advanced thermodynamics and its application to a range of problems of relevance to practical engineering. The course aims to equip you with basic tools and methodologies for carrying out thermodynamic analyses of engineering systems in advanced level.

Course Outcomes:

1. Understand the underpinning natural and physical sciences and the engineering fundamentals with operating principles of energy flows to the systems applicable to the engineering discipline
2. Describe and apply basic thermodynamic principles and laws of physics to analyzing and predicting performance of idealized forms of thermodynamic systems and then relate this idealized system models to corresponding real systems.
3. Build knowledge of contextual factors impacting the engineering discipline
4. Apply engineering techniques, tools and resources and assess benefits of improvements to thermodynamic systems

5. Effective oral and written communication in professional and lay domains.

ME 409: Renewable Energy

3.00 Contact Hour; 3.00 Credit Hours; Pre-requisite: None

Text and Ref Books:

1. Energy Resources and Policy – R. C. Dorf
2. Alternative Energy Sources: a Strategy Planning guide – R. T. Sheahan

Course Objectives:

1. To introduce renewable energy technologies and emphasize exploration of principles and concepts as well as the application of renewable energy technologies (RET).
2. To Explores topics such as energy consumption, the pros and cons of renewable energy, energy production and cons, energy conversion, environmental issues and concerns, electrical grid, biomass and bio fuels, geothermal, wind, power, solar power, nuclear power, and hydropower systems.

Course Synopsis:

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.

Course Outcomes:

1. Identify issues facing the renewable energy industry and understanding of specialist bodies of knowledge within the engineering discipline.
2. Understand contextual factors impacting the engineering discipline and also an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice
3. Investigate basic social, political, economic and ecological factors impacting renewable energy resources and systems regionally, nationally and abroad.
4. Evaluate the financial costs and benefits of a renewable energy project.

ME 411: Combustion and Pollution

3.00 Contact Hour; 3.00 Credit Hours; Pre-requisite: None

Text and Ref Books:

1. Industrial Combustion Pollution and Control - Charles E. Baukal, Jr.
2. Combustion Engineering – G L Borman, K. W Ragland, Publisher – McGraw-Hill International

Course Objectives:

1. To introduce 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.
2. To analyze the production of pollutants in combustion systems; Emissions of greenhouse gases, carbon monoxide, oxides of nitrogen and Sulphur, and other pollutants.

Course Synopsis:

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 greenhouse 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.

Course Outcomes:

1. Recognize the ongoing role of combustion, both of fossil and bio-fuels, in providing a more sustainable energy source for society, and the environmental challenges to be met to achieve this.
2. Explain the responsibility of engineers to the community in terms of providing a safe healthy environment.
3. Identify the formation mechanisms and reduction strategies of pollutant species in combustion systems and design the technology and the logic behind after-treatment of pollutants
4. Identify design trade-offs between increasing engine performance and maintaining low emission characteristics and explain the technology and the logic behind after-treatment of pollutants.

ME 413: Energy and Environment

3.00 Contact Hour; 3.00 Credit Hours; Pre-requisite: None

Text and Ref Books:

1. Principles of Energy conversion – A W Culp
2. Energy, Environment and Development– José Goldemberg, Oswaldo

Course Objectives:

1. To provide a deep understanding of the issues of energy production, transmission and usage.
2. To discuss qualitatively and quantitatively, informed by a working knowledge of the physical principles governing the transformation of energy from one form to another.

Course Synopsis:

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.

Course Outcomes:

1. Understand of the underpinning natural and physical sciences and the engineering fundamentals applicable to the engineering discipline and explain the physical principles governing energy transformations using correct terminology
2. Specify suitable units for, and state the relationships between basic physical quantities such as force, work, energy, temperature (developing the knowledge capability dimension)
3. Identify how environmental science has interdisciplinary connections with other sciences.
4. Analyze and solve problems in environmental science by selecting and applying practical and/or theoretical techniques with technical competence in conducting field, laboratory-based, or virtual experiments

ME 415: Advanced Programming with MATLAB

3.00 Contact Hour; 3.00 Credit Hours; Pre-requisite: ME 363, ME 171

Text and Ref Books:

1. Introduction to Optimum Design - Jasbir Singh ArorA
2. Numerical Methods for Engineers and Scientists Using MATLAB - Ramin S. Esfandiari
3. MATLAB Programming for Engineers – Stephen J Chapman

Course Objectives:

1. To review of basic MATLAB features, class organization and functionality.
2. To study about advanced graphical features of MATLAB. Effective use of programs written in C, FORTRAN and use of SIMULINK.

Course Synopsis:

Advanced MATLAB syntax; Object Oriented Programming, Handle Graphics/Graphical User Interface. Project brainstorming, Building, ODE solver suite in MATLAB, Simulink architecture and programming, Intro to C, CMEX interface, Java and Java classes in MATLAB, XML in MATLAB.

Course Outcomes:

1. Students will be able use advanced programming features of the Matlab language, including multidimensional arrays.
2. They are also able to create user defined classes and graphical user interfaces. Students are able to interface C-language programs into Matlab and/or use Java and Java classes within Matlab environment.

ME 417: Engineering Multiphase Flow

3.00 Contact Hour; 3.00 Credit Hours; Pre-requisite: ME-321, ME-323, ME-305

Text and Ref Books:

1. Multiphase flow and Fluidization - Dimitri Gidaspow, Brennen, C.E. Fundamentals of Multiphase Flow.
2. Crowe, C.T. “Multiphase Flow Handbook”. Taylor & Francis, Boca Raton

Course Objectives:

1. To covers the common background material and emphasizes the latest empirical and mechanistic modeling, computational and instrumentation aspects of multiphase flows
2. To design and operate different type of multiphase flow reactors will be introduced and their functioning, advantage and disadvantages and challenges along with future direction of research will be discussed

Course Synopsis:

Fundamental fluid mechanics and heat, mass, and energy transport in multiphase flows. Liquid/vapor/gas (LVG) flows, nucleation, bubble dynamics, cavitating and boiling flows, models of LVG flows; instabilities, dynamics, and wave propagation; fluid/structure interactions. Discussion of two-phase flow problems in conventional, nuclear, and geothermal power plants, marine hydrofoils, and other hydraulic systems.

Course Outcomes:

1. Cover the common background material and emphasizes the latest empirical and mechanistic modeling, computational and instrumentation aspects of multiphase flows.

2. Emphasis on bubble and particle dynamics, including sediment transport, cavitations, atomization and other environmental and industrial processes
3. Understand the basic mechanistic - and thermodynamic concepts behind typical multiphase models, and ability to apply this - along with current computational tools to further research and development in science and technology.
4. Introduce different types of multiphase flow reactors and their functioning, advantage and disadvantages and challenges along with future direction of research will be discussed.

ME 419 Introduction to Nanomaterials and Nanotechnology

3.00 Contact Hour; 3.00 Credit Hour

Text and Ref Books:

1. Introduction to Nanotechnology - Frank J. Ovens

Course Objectives:

1. Provide an overview of methods and techniques available for characterising materials relevant to nanoscale technologies.
2. Develop a framework for effective and reliable use of resources that are available for characterisation of objects whose properties depend on meso- and nanoscale structure;
3. Provide the basic tools for formulating a plan of attack for obtaining relevant, reliable and cost-effective information.
4. Acquire the background to survey the literature and to hold informed discussions with relevant experts.

Course Synopsis:

General and broad introduction to the multi-disciplinary field of nanotechnology. Basic knowledge of the physical phenomena, theoretical concepts and experimental techniques behind the recent vastly improved ability to observe, fabricate and manipulate individual structures on the nanometer scale.

Merge of the top-down approach of microelectronics and micromechanics with the bottom-up approach of chemistry/biochemistry. Recent scientific and technology work in the Nano world to demonstrate the potential of nanoscience and industrial applications of nanotechnology.

Course Outcomes:

1. On successful completion of this course, students should have the skills and knowledge to:
2. Explain the fundamental principles of nanotechnology and their application to biomedical engineering.
3. Apply engineering and physics concepts to the nano-scale and non-continuum domain.
4. Identify and compare state-of-the-art nanofabrication methods and perform a critical analysis of the research literature.
5. Design processing conditions to engineer functional nanomaterials.
6. Evaluate current constraints, such as regulatory, ethical, political, social and economic, encountered when solving problems in living systems.
7. Apply and transfer interdisciplinary systems engineering approaches to the field of bioand nanotechnology projects.
8. Discuss and evaluate state-of-the-art characterization methods for nanomaterials, and determine nanomaterial safety and handling methods required during characterization.

ME 423: Fluid Engineering

3.00 Contact Hour; 3.00 Credit Hours; Pre-requisite: ME-323

Text and Ref Books:

1. Foundation of Fluid Mechanics – S. W. Yuan
2. Fluid Mechanics for Engineering - Schobeiri, Meinhard T

Course Objectives:

1. To study the application of fluid and thermodynamic principles to engineering applications. It includes sustainability issues; fundamental scientific principles; fundamentals of vacuum technology; properties of gases and liquids; heat transfer due to conduction, convection and radiation heat and compression processes; closed and energy transfers related to compressors, boilers, turbine heat exchangers, heat engines, refrigerators and heat pump performance.
2. To design fluid systems and components, forces on floating and submerged bodies, turbine and pumping systems, and jet forces on blades and plates.
3. To study the principles to a variety of real-world engineering applications including simple flow networks and pump & turbine design.

Course Synopsis:

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.

Course Outcomes:

1. Understand of the underpinning natural and physical sciences and the engineering fundamentals applicable to the practice area.
2. Understand the mathematics, numerical analysis, statistics, and computer and information sciences which underpin the practice area.
3. Develop In depth practical knowledge and skills within specialist sub-disciplines of the practice area.
4. Develop creative, innovative and pro-active demeanor.

ME 425: Aerodynamics

3.00 Contact Hour; 3.00 Credit Hours; Pre-requisite: ME-323

Text and Ref Books:

1. Fundamentals of Aerodynamics – John D. Anderson
2. Aircraft Performance: Theory and Practice – M. E. Eshelby, M. Eshelby
3. Mechanics of Flight – Warren F. Phillips
4. Foundations of Aerodynamics: Bases of Aerodynamics Design – Arnold M. Kuethe, Chuess-yen chow
5. Illustrated Guide to Aerodynamics – Hubert C. Smith

Course Objectives:

1. To study the application of aerodynamics with the fundamental knowledge
2. To understanding the principles of aerodynamics from subsonic through to supersonic flight, stability and control and, aircraft performance.

Course Synopsis:

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.

Course Outcomes:

1. Relate concepts of aerodynamics and associated fluid mechanics to aircraft design and operation.
2. Apply basic aerodynamic principles to analyze the aerodynamic characteristics of idealized representations of aircraft components and systems and determine the aerodynamic forces that act on aero foils.
3. Discuss aspects of flight characteristics that relate to lift, drag, thrust and power to derive and apply the aircraft flight mechanics equations to analyze the flight performance of aircraft in different situations.
4. Explain various types of air flows in connection to attitudes of flight and aircraft orientation in maneuvering and examine and perform calculations involving lift, drag, thrust and power in relation to various aspects of flight and aircraft performance.
5. Identify limitations of the aerodynamics and flight mechanics principles and equations as applied to aircraft.

ME 427: Applied Engineering Mathematics

3.00 Contact Hour; 3.00 Credit Hours; Pre-requisite: None

Text and Ref Books:

1. Applied Engineering Mathematics – Erwin Kreyzig, Publisher – Wiley
2. Mathematical methods for physicists and Engineers – Royal Eugune Collins, Publisher – Dover Publications
3. Engineering Mathematics – K. A. Stroud, Denter J. Booth, Publisher – Industrial press

Course Objectives:

1. To provide students with the skills, knowledge and attitudes required to perform fundamental mathematical procedures and processes for solution of engineering problems, particularly the use of calculus, vector analysis and infinite series.
2. To show the relevance of mathematics to engineering and applied science.

Course Synopsis:

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.

Course Outcomes:

1. Understand of the underpinning natural and physical sciences and the engineering fundamentals applicable to the engineering discipline
2. Simplify expressions and solve simple problems involving Exponential, Logarithmic, Trigonometric, Inverse Trigonometric, Hyperbolic and Inverse Hyperbolic Functions and apply the principles of Three-Dimensional Vector algebra to solve a variety of basic problems in Engineering and Applied Science.
3. Apply the principles of Analytical Geometry and vector analysis to determine the equations of and relationships between straight lines and planes in Three Dimensional Space.

4. Aim to show the relevance of mathematics to engineering and applied science and use various types of Series to approximate given functions and hence solve simple problems involving Linear and Quadratic approximations and evaluation of integrals.
5. Apply engineering techniques, tools and resources to solve a variety of practical problems in Engineering and Applied Science.

ME 429: Gas Dynamics

3.00 Contact Hour; 3.00 Credit Hours; Pre-requisite: None

Text and Ref Books:

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

Course Objectives:

1. To cover the basic concepts and results for the compressible flow of gases and introduction to the numerical method of characteristics.
2. To introduce the students to the numerical method of characteristics. of compressible flow of gases

Course Synopsis:

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.

Course Outcomes:

1. Develop the Behavior of equilibrium and frozen flows with real gas properties.
2. Analyze non-equilibrium (rate) processes and behavior for gas dynamic flows.
3. Formulate and solve problems in one -dimensional steady compressible flow including: isentropic nozzle flow, constant area flow with friction (Fanno flow) and constant area flow with heat transfer (Rayliegh flow).
4. Derive the conditions for the change in pressure, density and temperature for flow through a normal shock and also determine the strength of oblique shock waves on wedge shaped bodies and concave corners.

ME 431: Finite Element Method

3.00 Contact Hour; 3.00 Credit Hour

Text and Ref Books:

1. Seshu, P., Textbook of Finite Element Analysis
2. Segerlind, L.J., Applied Finite Element Analysis

Course Objectives:

1. To learn basic principles of finite element analysis procedure.
2. To learn the theory and characteristics of finite elements that represent engineering structures.
3. To learn and apply finite element solutions to structural, thermal, dynamic problem to develop the knowledge and skills needed to effectively evaluate finite element analyses performed by others.
4. Learn to model complex geometry problems and solution techniques.

Course Synopsis:

Introduction - Illustration using spring systems and simple problems - Weighted residual methods Galerkin's method - Variational approach - Rayleigh-Ritz method.

One-dimensional finite element analysis; bar element, beam element, frame element - Heat transfer problems.

Two-dimensional finite element analysis; types of elements, shape functions, natural coordinate systems.

Applications to structural mechanics - Numerical integration - Solution of finite element equations.

Fluid flow problems - Dynamic problems.

Course Outcomes:

1. Interpret the philosophy behind principles, design and modelling considerations in using finite element analysis.
2. Describe the general steps used in the finite element analysis to model problems in engineering.
3. Develop stiffness matrices for spring, truss, beam, plane stress problems and three dimensional problems.
4. Develop the finite element formulations for heat transfer problems.
5. Describe the concept of direct equilibrium method and potential energy method for structural mechanics problems.
6. Explore the issues in convergence of solutions using finite element analysis.
7. Develop expertise in the usage of commercial finite element software.
8. Create and design engineering structures using finite element methods.
9. Predict the safe design limits for engineering structures.
10. Communicate effectively through a written report the creation of optimized design of engineering structures.

ME 433: Fluidics

3.00 Contact Hour; 3.00 Credit Hours; Pre-requisite: None

Text and Ref Books:

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

Course Objectives:

1. To entail the science of manipulating and controlling fluids and particles at micron and submicron dimensions and the technology associated with the development of methods and devices to exploit this for a wide range of applications from point-of-care diagnostics to high throughput drug screening and gene sequencing, amongst others.
2. To explore the fundamental theories underpinning the physics of liquid and particle transport at these scales, and their applications to various biotechnological applications such as those indicated above
3. To focus on several enabling microfluidic and nanofluidic technologies such as electro kinetics, optofluidic and acoustics

Course Synopsis:

Introduction - Illustration using spring systems and simple problems - Weighted residual methods Galerkin's method - Variational approach - Rayleigh-Ritz method. One-dimensional finite element analysis; bar element, beam

element, frame element - Heat transfer problems. Two-dimensional finite element analysis; types of elements, shape functions, natural coordinate systems. Applications to structural mechanics - Numerical integration - Solution of finite element equations. Fluid flow problems - Dynamic problems.

Course Outcomes:

1. Specify the use of microfluidic and nano fluidic devices for a range of applications across medicine, pharmaceutics, defense and energy.
2. Describe/model the physical behavior of fluids and particle at the micron and nanometer length scales through continuum and molecular theories.
3. Describe various fluid and particle transport mechanisms in micro/nano channels or devices and explain the fundamental operation of basic microfluidic components such as fluidic channels, mixers, separators, valves and micro-pumps.
4. Design practical microfluidic and nano fluidic devices for various biotechnological applications.

ME 435: Introduction to CFD

3.00 Credit Hour; 3.00 Contact Hour; Pre req: ME 321 & ME 323

Text and Ref books:

1. Computational Fluid Dynamics, J.D. Anderson
2. Computational Methods for Fluid Dynamics, J.H. Ferziger & M. Peric
3. Computational Techniques for Fluid Dynamics 1, C.A.J. Fletcher
4. Computational techniques for Fluid Dynamics 2, C.A.J. Fletcher, 2nd Edition.

Course Objectives:

To introduce the student to widely used techniques in the numerical solution of fluid equations, issues that arise in the solution of such equations, and modern trends in CFD. Emphasis will be on 'learning by doing', as students will work on programming projects for assignments.

Course Synopsis:

Introduction: Computational Fluid Dynamics (CFD)- a research, modeling and design tool, historical perspective, commercial CFD packages, mathematical description of physical phenomena, a brief discussion of discretization methods-finite difference, finite element. Introduction to control volume method.

Numerical solution of diffusion type equations: Steady one-dimensional conduction, unsteady one dimensional conduction, two and three- dimensional situations.

Numerical solution of convection-diffusion-type equations: Steady one-dimensional convection-diffusion, discretization equation in two and three-dimensions.

Numerical solution of fluid flow equations: Discretization of continuity and momentum equations for fluid flow, pressure-based algorithms- SIMPLE & SIMPLER

Course Outcomes:

1. Provide the student with a significant level of experience in the use of modern CFD software for the analysis of complex fluid-flow systems.
2. Improve the student's understanding of the basic principles of fluid mechanics.
3. Improve the student's research and communication skills using a self-directed, detailed study of a complex fluid-flow problem and to communicate the results in written form

ME 437: Design of Fluid Machines

3.00 Contact Hour; 3.00 Credit Hours; Pre-requisite: ME-232

Text and Ref Books:

1. Mechanics of fluids by Irving h. shames
2. An Introduction to Fluid Dynamics: Principles of Analysis and Design by Stanley Middleman

Course Objectives:

1. To analyze the fluid flow and particle mechanics with an emphasis on fundamental concepts and applications in process industries.
2. To design and analyze fluid flow systems and equipment handling fluid-particle systems.
3. To study the empirical formulae, theory and some simple mathematical derivations. Examples and applications will generally cover fluid machinery, pipe flow and fluid-particle systems.

Course Synopsis:

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.

Course Outcomes:

1. Understand the underpinning natural, physical sciences and the engineering fundamentals applicable to the engineering discipline.
2. Develop in depth practical knowledge and skills within specialist sub-disciplines of the practice area
3. List and elaborate the principles of incompressible fluid flow and the mechanisms of particle motion in fluid
4. Enables students to design simple fluid flow systems

ME 439: Bio-fluid Mechanics

3.00 Contact Hour; 3.00 Credit Hour; Pre requsite: ME 323.

Text and Ref books:

1. Applied Biofluid Mechanics, Lee Waite and Jerry Fine
2. A Brief Introduction to Fluid Mechanics, Young, Munson, and Okiishi

Course Objectives:

This is an introductory course in the study of fluid mechanics and bio fluids. The student will gain the understanding of the underlying assumptions and models that are applied when solving fluid mechanics problems. Based on the assumptions made, the student will learn to differentiate between the various approaches and solutions applied to a wide variety of fluid mechanics problems related to physiological processes, medical devices, and laboratory setups as used for testing and measuring. A significant objective is to reinforce the student's prior knowledge in calculus, differential equations, and engineering as it applies to fluid mechanics. Computational Fluid Dynamics (CFD) and MATLAB will be introduced to emphasize Computer Aided Engineering (CAE).

Course Synopsis:

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 emphasizing qualitative consideration; Presentations and discussions; Simulation of physiological phenomena.

Course Outcomes:

1. Understand physiologically relevant fluid and solid mechanics.
2. Apply fluid mechanical analyses relevant to biomedical engineering problems
3. Understand and analyze velocity measurement techniques relevant to blood flow (e.g., MRI, Ultrasound, Doppler)

ME 441: Theory of Structures

3.00 Contact Hour; 3.00 Credit Hour; Pre req.: ME 243

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.

Course Objectives:

To introduce the students to concept of global structural stability, theory of structural analysis, and methods in structural analysis

Course Synopsis:

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.

Course Outcomes:

On successful completion of the course students will be able to:

1. Translate a stated problem in theory of structures to an analytic form.
2. Apply appropriate solution techniques to the problem.
3. Calculate the correct answer to the given problem.
4. Interpret the meaning of the outcome.
5. Recognize limitations of the solution techniques and the outcomes

ME 445: Noise and Vibration

3.00 Contact Hour; 3.00 Credit Hour; Pre/Co-Requisite: None

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.

Course Objectives:

1. To make students familiar with state-of-the-art of noise and vibration for solving various problems at motor vehicles and powertrain development.
2. To explain to students mathematical and physical fundamentals of computational models that are built up to ready-to-use software level for various problems.

Course Synopsis:

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.

Course Outcomes:

1. Develop understanding of sound interference, refraction, diffraction and scattering; the basic concepts of active noise and vibration control; the concepts and methods of passive noise and vibration control.
2. Describe, quantify, predict, measure and analyze noise and vibration signals, to describe the physiological and subjective responses of humans exposed to noise and vibration, quantify the exposure and assess the response.
3. Apply engineering and other methods for controlling exposure to noise and vibration.
4. Enable students to apply Noise and Vibration on human body and hand-arm vibration effect and the relevant related legislation.

ME 447: Robotics

3.00 Contact Hour; 3.00 Credit Hour; Pre/Co-Requisite: None

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.

Course Objectives:

To introduce new technologies and operating practices in advanced manufacturing and a range of other technical industries including mechanical systems design, mechatronics and micro- and nano-technology.

Course Synopsis:

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.

Course Outcomes

1. Acquire the knowledge on advanced algebraic tools for the description of motion and can use matrix algebra and Lie algebra for computing the kinematics of robots
2. Develop the ability to analyze and design the motion for articulated systems.
3. Develop an ability to use software tools for analysis and design of robotic systems and to develop the path planning for a robotic system.
4. Develop proficient skill in the use of Maple or MATLAB for the simulation of robots and in calculation the forward kinematics and inverse kinematics of serial and parallel robots.

ME 449: Composite Materials

3.00 Contact Hour; 3.00 Credit Hour; Pre/Co-Requisite: None

Text and Ref books:

1. Mechanics of composite Materials – Autar K. Kaw, Publisher – CRC Press, 1997.
2. MechanicsofcompositeMaterials–RobertM.Jones, Publisher–JohnBenjamins Publishing Co, 1975.
3. Introduction to Composite Materials – Stephen W. Tsai,Publisher–CRCpress,1980

Course Objectives:

1. To focus on fiber-reinforced polymer composites, and covers design, manufacture, testing and through-life performance of composite structures.
2. To cover design, advanced manufacturing processes, micromechanical modelling, mechanical properties, fracture and fatigue, durability, repair and non-destructive evaluation of composites.
3. To obtain knowledge, skills and attitudes needed for the optimum design and manufacture of advanced composite components.

Course Synopsis:

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.

Course Outcomes:

1. Develop in-depth understanding of specialist bodies of knowledge within the engineering discipline.
2. Apply engineering techniques, tools and resources.
3. Select the most appropriate manufacturing process for fabricating composite components.
4. Describe the fracture, fatigue and impact performance of composites.

ME 453: Applied Aerodynamics

3.00 Contact Hour; 3.00 Credit Hour; Pre/Co-Requisite: None

Text and Ref books:

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

Course Objectives:

1. To introduce students to the fundamentals and practical aspects of incompressible and compressible flows
2. To understand the design and operation of flow systems, including pipe networks, automobiles and flight vehicles.

Course Synopsis:

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; Takeoff 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.

Course Outcomes:

1. Provide the students an understanding of fluid properties in the atmosphere, dimensional analysis, main aircraft components.
2. Introduce students to analysis of aerodynamics effects on aircraft performance, dynamics, stability and control.
3. Calculate flow patterns, pressure distribution and forces in irrotational flows of simple geometry, using superposition principles.

ME 461: Control Engineering

3.00 Contact Hour; 3.00 Credit Hour

Text and Ref books:

1. Introduction to Automatic Controls (2^{nd} edition) – Howard L. Harrison, John G. Bollinger.
2. Control System Engineering – N. S. Nise, Modern control System – R. C. Dorf, R. C.Bishop.

Course Objectives:

To understand concepts of the mathematical modeling, feedback control and stability analysis in Time and Frequency domains

Course Synopsis:

Introduction to control systems and their representation by different equations and Laplace transforms; Block diagrams and transfer functions; Analog computer solution of system equations; 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; Introduction to digital computer control.

Course Outcomes:

1. Define and explain feedback and feed-forward control architecture and discuss the importance of performance, robustness and stability in control design
2. Interpret and apply block diagram representations of control systems and design PID controllers based on empirical tuning rules

3. Compute stability of linear systems using the Routh array test and use this to generate control design constraints
4. Use Evans root locus techniques in control design for real world systems
5. Compute gain and phase margins from Bode diagrams and Nyquist plots and understand their implications in terms of robust stability
6. Design Lead-Lag compensators based on frequency data for an open-loop linear system.

ME 463: Petroleum Engineering

3.00 Contact Hour; 3.00 Credit Hour; Pre-Requisite: None

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, 2nd edition, 2001.

Course Objectives:

1. To provide excellent instruction and design experiences essential for graduates to enter the practice of petroleum engineering and pursue life-long professional development.
2. To conduct research that generates, communicates, and applies new knowledge for the betterment of society.
3. To foster a spirit of service and leadership among students and faculty and assist the public in addressing issues concerning the use of resources, protection of the environment, and development of infrastructures.

Course Synopsis:

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 behavior 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.

Course Outcomes:

1. Develop excellent instruction and design experiences essential for graduates to enter the practice of petroleum engineering and pursue life-long professional development
2. Conduct research that generates, communicates, and applies new knowledge for the betterment of society
3. Design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability
4. Use the techniques, skills, and modern engineering tools necessary for engineering practice

ME 465: Automotive Chassis Components Design

3.00 Contact Hour; 3.00 Credit Hour

Text and Ref books:

1. Giri, N.K., "Automobile Mechanics", Khanna Publishers, New Delhi, 2007.
2. Khurmi. R.S. & Gupta. J.K., "A Textbook of Machine Design", Eurasia Publishing House (Pvt) Ltd, 2001.
3. Heldt, P.M., "Automotive Chassis", Chilton Book Co., 1992.
4. Dean Averns, "Automobile Chassis Design", Illife Book Co., 2001.
5. J. Reimpell, H Stoll, J. W Btezler "The Automotive Chassis", Engineering Principle, 2nd edition
6. Maurice Olley, "Chassis Design Principle and Analysis"
7. Giancario Genta, Lorenzo Morello "The Automotive Chassis", Springer

Course Objectives:

The student will be able to understand the fundamental principles involved in design of components of automotive chassis, the complete design exercise and arrive at important dimensions of chassis components.

Course Synopsis:

Vehicle Frame and Suspension: Study of Loads-Moments and Stresses On Frame Members. Design of Frame for Passenger and Commercial Vehicle, Front Axle and Steering Systems: Analysis of Loads-Moments and Stresses at Different Sections of Front Axle. Determination of Bearing Loads at Kingpin Bearings. Wheel Spindle Bearings. Choice of Bearings. Determination of Optimum Dimensions and Proportions for Steering Linkages, Ensuring Minimum Error in Steering. Design of Front Axle Beam. Clutch: Design of Single Plate Clutch, Multiplate Clutch and Cone Clutch. Torque Capacity of Clutch, Design Details of Roller and Sprag Type of Clutches, Layout of Gearboxes, Drive Line and Rear Axle. Design Details of Final Drive Gearing. Design Details of Full Floating, Semi floating and Three-Quarter Floating Rear Shafts and Rear Axle Housings and Design Aspects of Final Drive.

Course Outcomes:

1. Gain knowledge about various vehicular structures.
2. Identify, formulate and solve engineering problems related to automobile drive line components.
3. Learn about the performances of various axles and to design the same.
4. Learn and design various braking systems.
5. Learn and design the various suspension systems.

ME 469: Vehicle Dynamics

3.00 Contact Hour; 3.00 Credit Hour

Text and Ref books:

1. Pacejka, Hans. "Tire and vehicle dynamics". Elsevier, 2005.
2. Wong, Jo Yung. "Theory of ground vehicles". John Wiley & Sons, 2001.
3. Moore, Desmond F. "The friction of pneumatic tires." (1975).
4. Jazar, Reza N. "Vehicle dynamics: theory and application". Springer, 2008
5. Gillespie, Thomas D. "Fundamentals of vehicle dynamics", 1992.

Course Objectives:

Vehicle Dynamics is one of core subjects in Mechanical Engineering in universities worldwide. Although road vehicles can be classified into various types based on different purposes, such as the single vehicle, sedan, passenger car, truck and special purpose vehicle, it is the rubber single tyre, single axle, four-wheel vehicle that defines the study object of this course. Based on this case, the traction and brake, ride and handling dynamics theory, as well as theory and design of vehicle control system are presented. Students thus learn about the fundamental theory of vehicle dynamics, vehicle performance as well as related tests and regulations. It is also an important goal to instruct them in the application of the dynamic modeling and analysis approach in vehicle design. The course of Automotive system dynamics can be treated as a core course for undergraduates majoring in vehicle engineering and for students majoring in mechanical engineering as a selected course.

Course Synopsis:

Review of Rigid Body Dynamics. Tire Mechanics: Overview, Terminology, Definitions, Slip, Skid, Rolling Resistance, Elastic Band Model for longitudinal slip, Simple model for lateral slip, Combined, longitudinal/lateral slip (friction ellipse), Taut string model for lateral slip, Magic Tire Formula. Vehicle Handling: Ackerman Steering Geometry, Steady Handling (2 DOF steady-state model), Understeer and Oversteer, Effect of Tire Camber and Vehicle Roll (3 DOF steady-state model), Transient Handling and Directional Stability (2 DOF unsteady model), Effect of Vehicle Roll on Transient Handling (3 DOF unsteady model), Steady-State and Transient Handling of Articulated Vehicles, Case Study 2: On-Center Steering of Passenger Vehicles. Vehicle Ride: Review of Vibration Principles, Human Perception of Vibration, Road Excitation and Vehicle Ride Models (low frequency), Suspension Characteristics: Ride versus Handling, Overview of Random Vibrations, Analysis of Vehicle Ride, Case Study 3: Influence of Seat Dynamics on Vehicle Ride, Case Study 4: Computer Simulation of Ride – Tracked Vehicles

Course Outcomes:

1. Apply vehicle dynamics theory to practical evaluation and measurement
2. Use governing state space equations and transfer functions to determine the effect of key parameters on primary ride and open loop handling
3. Describe the current “state-of-the-art” of vehicle dynamics CAE
4. Articulate various types of vehicle dynamics models
5. Recognize kinematics and compliance (K&C) lab tests commonly used to quantify chassis system performance
6. Identify and evaluate important K&C metrics used in vehicle dynamics development
7. Identify and utilize important vehicle tests commonly used in industry to evaluate ride, steering and handling performance
8. Relate chassis system characteristics to vehicle dynamic performance
9. Utilize vehicle dynamics CAE software for the simulation of common physical lab and vehicle tests
10. Apply design-of-experiments (DOE) to vehicle dynamics development.

ME 471: Bio-Engineering

3.00 Contact Hour; 3.00 Credit Hour; Pre/Co-Requisite: None

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 Mascalo - Skeletal System – B. M. Nigg.

Course Objectives:

1. To practice biomedical engineering to serve state and regional industries, hospitals, government agencies, or national and international industries.
2. To work professionally in one or more of the following areas: biomedical electronics, medical instrumentation, medical imaging, biomedical signal processing, rehabilitation engineering, neuro engineering, and biomaterials.
3. To achieve personal and professional success with awareness and commitment to their ethical and social responsibilities, both as individuals and in team environments.
4. To maintain and improve their technical competence through lifelong learning, including entering and succeeding in an advanced degree program in a field such as engineering, science, business, or medicine.

Course Synopsis:

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.

Course Outcomes:

1. Develop knowledge on human physiology, biology and neuroscience to solve the problems at the interface of engineering and biology.
2. Develop the ability to identify and apply appropriate engineering techniques to Address the problems associated with the interaction between living and non-living materials and systems.
3. Interpret data from living systems to facilitate the understanding of the human body through theoretical models and experimental methods.
4. Evaluate alternate assumptions, approaches, procedures, tradeoffs, and results related to engineering and biological problems.

ME 473: Plastics Process Technology

3.00 Contact Hour; 3.00 Credit Hour; Pre/Co-Requisite: None

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.

Course Objectives:

1. To identify properties and classifications of materials for processing implications such as flow and treatment.
2. To interpret process specifications of materials.
3. To communicate pertinent technical data electronically.
4. To discuss recent technical developments in plastics affecting molds, materials, and processes

Course Synopsis:

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, below moulding, film blowing, compression moulding, and transfer moulding; Reinforcement of plastics; Calendaring and laminating; Instrumentation and control.

Course Outcomes:

1. Develop in-depth understanding of specialist bodies of knowledge within the engineering discipline
2. Apply engineering techniques, tools and resources
3. Analyze the application of this unit in the workplace in an individual product designer designing and producing a plastic product from a brief. The nature of the plastic product may vary greatly but the outcome would be a complete plastic product.
4. Use a wide range of tools, equipment and materials and the concepts developed would convey strong conceptual and theoretical development. This work would usually be carried out independently although guidance would be available if required

ME 475: Modern Manufacturing Technology

3.00 Contact Hour; 3.00 Credit Hour; Pre/Co-Requisite: None

Text and Ref books:

1. Manufacturing Engineering and Technology – Serope kalpakjian, Steven R. Sahmid, Publisher – Prentice Hall, 4th edition, 2000.

2. Machine Tool Technology and Manufacturing Processes -C. Thomas olivo, Publisher – Delmar Thomson Learning, 1987.

Course Objectives:

1. To provide students with a broad overview of modern manufacturing technologies
2. To ensure the students understand their fundamental principles and processes.
3. To enhance the students' appreciation for modern manufacturing technologies up to date applications from manufacturing industries are presented.

Course Synopsis:

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.

Course Outcomes:

1. Understand the principles and techniques of casting, forming, joining and finishing operations and be able to determine their suitability
2. Comprehend and apply advanced theory-based understanding of engineering fundamentals and specialist bodies of knowledge in the selected discipline area to predict the effect of engineering activities and solve related problems.

3. Describe associated issues, investigate and analyze complex engineering systems to evaluate various additive and rapid manufacturing technologies and their application in modern manufacturing process
4. Understand the principles of additive manufacturing from CAD design to part manufacture, particularly how these principles can be used in practical applications

ME 477: Metal Cutting Process

3.00 Contact Hour; 3.00 Credit Hour; Pre/Co-Requisite: None

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.
5. Machine Tool operations – Steve F. Krar, Joseph V. St, Amand, J. William Oswald.

Course Objectives:

1. To undertake basic cutting operations under supervision.
2. To introduce the setup and cutting components by using lathes, milling machines, cut off saws, pedestal grinders and fixed position drilling machines. Marking out skills are also included as necessary in the cutting process.

Course Synopsis:

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.

Course Outcomes:

1. Sequence operations, identifying and clarifying application requirements.
2. Identify specifications and required resources, reviewing and revising outcomes against task objectives and requirements.
3. Interpret information and specifications categorizing manufacturing methods, developing enterprise procedures, calculations relating to engineering processes within the scope of this unit.
4. Access information sources using a variety of methods, applications, features and principles of engineering processes.

ME 479: CAD/CAM

3.00 Contact Hour; 3.00 Credit Hour; Pre-Requisite: None

Text and Ref books:

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

Course Objectives:

1. To teach the theory and tools of Computer Aided Design (CAD) and Computer Aided Manufacturing (CAM) with an emphasis on the central role of the geometric model in their seamless integration. It focuses on the integration of these tools and the automation of the product development cycle.
2. To introduce geometric modeling techniques, data structure design and algorithms for solid modeling. It also covers the machining theory, automated CNC machining, and process control.

Course Synopsis:

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 software; Interfacing CAM software with CNC machines; Computer aided machining.

Course Outcomes:

1. Evaluate and apply CAD/CAM or business software and related devices to produce digital graphic and hard copy formats that effectively communicate information across designated levels of the fashion and textiles supply chain.
2. Compare and contrast between standard and dedicated CAD/CAM software/hardware systems and explain their integrated use within textile, fashion, and merchandising contexts.
3. Explain and advice on issues regarding CAD/CAM and related software applications in a fashion and textile context.
4. Understand the capabilities of general Computer Aided Designing Systems and CAD Systems for designing mechanical parts and elements in 2D and 3D dimensions.

ME 485: Introduction to Nuclear Engineering

3.00 Contact Hour; 3.00 Credit Hour; Pre/Co-Requisite: None

Text and Ref books:

1. Introduction to Nuclear Engineering Paperback – 2014-John R. & Baratta Anthony J. Lamarsh
2. Fundamentals of Nuclear Science and Engineering 1st Edition-J. Kenneth Shultis,Richard E. Faw

Course Objectives:

1. To introduce nuclear science and its engineering applications.
2. To describe basic nuclear models, radioactivity, nuclear reactions and kinematics; covers the interaction of ionizing radiation with matter, with an emphasis on radiation detection, radiation shielding, and radiation effects on human health.
3. To present energy systems based on fission and fusion nuclear reactions, as well as industrial and medical applications of nuclear science.

Course Synopsis:

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 and safety; Nuclear power reactor systems; Safety, Safeguard, and Security of Nuclear power plant; Introduction to nuclear medicine.

Course Outcomes:

1. Apply nuclear engineering techniques, tools and resources by developing fluency in basic nuclear physics.
2. Understand the underpinning natural and physical sciences and the engineering fundamentals to evaluate quality of scientific claims.
3. Develop knowledge of contextual factors impacting the engineering discipline and learn about seminal radiation experiments and hypothesis.
4. Describe the origins, interactions, uses, detection and biological/chemical effects of ionizing radiations to explore systems and reactors that use radiation.

ME 491 Mems Devices - Design and Fabrication

3.00 Contact Hour; 3.00 Credit Hour

Text and Ref Books:

1. Tai – Ran Hsu, "MEMS& Microsystems Design and Manufacturing", Tata McGrawhill Edition, 2006

References

2. Mohamed Gad-el-Hak, "MEMS: Design and Fabrication (Mechanical Engineering)", CRC; 1 edition, 2005.

3. Marc J. Madou, "Fundamentals of Microfabrication, the science of Miniaturization", CRC Press Second Edition, 2002.

4. Sami Franssila, "Introduction to Microfabrication", John Wiley; 1 edition, 2004.

5. John A. Pelesko, David H. Bernstein, "Modeling MEMS and NEMS", CRC; 1 edition, 2002

Course Objectives:

1. Familiar with the fundamentals, fabrication process and applications of MEMS.
2. Understand the basic principles of MEMS sensors and actuators (mechanical, electrical, piezoresistive, piezoelectric, thermal, microfluidic).
3. Understand the design considerations of basic MEMS sensors and actuators.
4. Design a basic MEMS sensor and actuator device, such as an inertia sensor, and a pressure sensor.
5. Design the process flow of a basic MEMS device, such as an inertia sensor (accelerometer), given a fabrication process description.
6. Understand the design constrains and the affect factors, i.e. power, speed, noise, etc.
7. Understand and familiar with the fabrication process through the hands-on activities.

Course Synopsis:

An overview of microelectromechanical devices and technologies, and an introduction to design and modeling Standard microelectronic fabrication technologies; bulk micromachining, surface micromachining, bonding technologies, related fabrication methods, and creating process flows.

Mechanical, thermal, electrical, magnetic, optical, and chemical properties of materials Introduction to lumped modeling of systems and transducers; an overview of system dynamics MEMS examples, energy methods, the thermal energy domain; modeling dissipative processes, Fluids and Transport.

Course Outcomes:

1. Design a basic MEMS device, such as a cantilever based actuator, pressure sensor, and accelerometer
2. Design the fabrication process of a MEMS device, such as a capacitive pressure sensor or an inertia sensor

3. Fabrication of a MEMS device, such as cantilever based actuator
4. Determine the fundamental trade-offs in a given basic MEMS device, and design with the suitable principles, materials, and structures
5. Estimate key specification and performance issues in a given MEMS device, such as power, speed, cost, process, and etc.

ME 493: Material Handling

3.00 Contact Hour; 3.00 Credit Hour

Text and Ref books:

1. Material Handling Systems Design – J. M. Apple.
2. MATERIAL HANDLING,Raymond A. Kulwiec, (1985), John Wiley, New Jersey.
3. FUNDAMENTALS OF PACKAGING TECHNOLOGY, KlalterSoroka, Richard Warrington, (1995)

Course Objectives:

1. Understand and be able to complete the following charts with regard to a specific.
2. Product, assembly chart, route sheet, operations process chart, from-to chart, and activity relationship chart.
3. Identify equipment requirements for a specific process.
4. Understand the benefit of an efficient material handling system.
5. Understand what effect process layout has on the material handling system.
6. Recommend improvements to existing plant layouts from the standpoint of material handling and product flow.
7. Design flexibility into a plant layout to accommodate changes in product volume or product line.
8. Integrate concepts and techniques learned through this course in order to design and efficient plant layout in a team environment.

Course Synopsis:

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.

Course Outcomes:

1. Learn fundamental principles of material handling systems.
2. Develop understanding of special concepts in material handling.
3. Learn analytical procedures for the study of different material handling equipment.
4. Learn fundamental principles of packaging.
5. Improve presentation and team work skills

ME 495: Mechatronics

3.00 Contact Hour; 3.00 Credit Hour; Pre/Co-Requisite: None

Text and Ref books:

1. Mechatronis – W. Botton, Publisher – Pearson Education.
2. Mechatronics – D Necsulescu.
3. Mechatronics – N. P. Mahalik.

Course Objectives:

1. To introduce the student to the concept of a combination of mechanical and electronic devices (Mechatronics), which incorporate pneumatic and hydraulic equipment controlled by PLC's or parallel interfaced computers.
2. To develop an ability to design a system, component, or process to meet desired needs within realistic constraints.
3. To develop an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

Course Synopsis:

Introduction; Organization structure; System concept; Mechanical, electrical, electronic and software components; Process; Software based tools; Virtual instrumentation; CAD; CAM; Computer integrated systems; Computer interfacing; Manipulators; Actuator types; Sensors and vision systems; Smart robots; Artificial intelligence; Factory, office, and home automation; Future trend.

Course Outcomes:

1. Define and formulate linear programming problems and appreciate their limitations and develop mathematical skills to analyze and solve integer programming and network models arising from a wide range of applications.
2. Conduct and interpret post-optimal and sensitivity analysis and explain the primal-dual relationship.
3. Solve linear programming problems using appropriate techniques and optimization solvers, interpret the results obtained and translate solutions into directives for action.
4. Communicate ideas, explain procedures and interpret results and solutions in written and electronic forms to different audiences.
5. Develop knowledge in applications and procedures for the operation of mechatronic systems in an industrial environment and define various facets of mechatronics and in particular select the appropriate hydraulic or pneumatic actuating components for a specified design requirement.
6. Analyze appropriate hydraulic or pneumatic control methods for a specified design requirement and draw hydraulic and pneumatic circuit diagrams taking into account the design requirements and Obtain practical skills in applying and integrating procedures for the operation of a mechatronic system in a Mechanic laboratory.
7. Evaluate essential aspects of PLC operation and programming and the logic sequence for an integrated mechatronic system including all operator actions, input signals, output action, interlocks and safety/emergency requirements (PLC and computer automation).
8. Use theoretical knowledge in a practical laboratory situation, and in conjunction with correct procedures, establish the skills required to analyze and overcome problems that may occur in a manufacturing environment.

ME 497: Textile Technology

3.00 Contact Hour; 3.00 Credit Hour

Text and Ref books:

1. Encyclopedia of Textile Finishing Set by: Hans-Karl Rouette.

2. Design and Manufacture of Textile Composites (Woodhead Publishing in Textiles)

Course Objectives:

1. Problem solve and apply sustainable practices related to fashion and textiles issues.

2. Utilise a systems approach to design and operational performance, have the technical and relevant design skills, in both analysis and synthesis to be able to exercise technical judgment in decision making and have the ability to undertake problem identification, formulation and solution.

Course Synopsis:

Knitting: Students will study the principles and machine processes needed to construct a range of knitted fabrics, including introduction to knitting, properties of knitted fabrics; basic knitting structures; machine knitting needles; warp and welt knitting machines; weft knit fabrics; warp knit fabrics; patterning and machine control (including computer design systems). Weaving**:** they will study the principles and machine processes used to construct a range of woven fabrics, including: introduction to weaving; the characteristics of weaving yarns; yarn preparation; the weaving cycle; types of woven fabric; quality in woven fabrics; colour and weave effect. **Non-wovens:** they will study the various processes used in the construction of non-woven products such as felts, batts, fabrics and disposables. Also includes a section on tufting processes (for non-wovens and carpets). It includes introduction to non-wovens; fibres; bicomponent fibres; web formation; bonding systems; felted fabrics; other fabric structures, and composite fabrics.

Course Outcomes:

1. Identify the manufacturing process at sector and enterprise level.
2. Outline the fundamentals of the weaving process.
3. Develop fabric analysis techniques to produce weaving specifications.
4. Design yarn preparatory operations, weaving operations and weaving production requirements for a range of woven fabrics.
5. Critique distinguishing features of knitting machines and their products.
6. Analyze the relationship between design technology and product development in hosiery and knitwear production.
7. Evaluate the effect of machine components and fabric construction in weft and warp knitting.
8. Identify the fundamentals of non-woven fabric production.
9. Evaluate the rationale for fabric testing and the parameters within which this testing takes place.

ME- 499 Weapon Engineering

3.00 Contact Hour; 3.00 Credit Hour

Text and Ref Books:

1. Charles E Balliesen, 'Principle of Firearms"
2. Brassey's Land Warfare "Guided Weapons", Into the 21st Century, 3rd Edition
3. Donald E Carlucci and Sidney S. Jacobson Ballistics "Theory and Design of Guns and Ammunition"

Course Objectives:

The course is designed to offer equally a broad and in-depth coverage of technologies used in the design, development, test and evaluation of weapon systems and military vehicles. Special attention will be given to recent advances in defence technology; and to educating students in the analysis and evaluation of systems against changes and developments in the threat.The course also offers a critical depth to undertake engineering analysis or the evaluation of relevant sub systems.

Course Synopsis:

Present and future trends in weapon technologies; Ballistic and ammunition fundamentals; Effect of blast; fragmentation and shaped charged warheads; blast analysis and structural design; Kinetic energy of penetrations; Dynamics of unguided weapons; fin and spin stabilization; Principle of missile flight and propulsion; Missile guidance techniques.Technology of small arms; Cycle of operation; Classification of small arms; Method of operation; classification of firing mechanism; safety mechanism.Technology of ordinance and carriage assembly; build-up of a gun; barrel design and stresses on barrel; gun control; breech mechanism; elevating and traversing mechanism; recoil mechanism; gun dynamics; balancing mechanism

Course Outcomes:

1. Describe and identify the elements that make up a gun system
2. Explain the fundamentals of weapon control and the constraints of sensors
3. Demonstrate an understanding of the current technology applied to gun barrels and breeches
4. Undertake analysis of gun recoil systems, barrel vibration and other aspects of gun dynamics

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CHAPTER 6

COURSE OFFERED BY OTHER DEPARTMENTS TO STUDENTS OF ME DEPARTMENT

6.1 List of Course Offered by Other Departments to Students of ME Department

Chem 103: Chemistry - I

3.00 Contact Hour 3.00; Credit Hour

Text and Ref Books:

1. Principles of Physical Chemistry – Haque & Nawab; Students' Publications.
2. Fundamentals of Physical Chemistry- Samuel H. Maron& Jerome B. Lando; MacMillan Publishing Co., Inc., Newyork.
3. Physical Chemistry P. W. Atkins; Oxford University Press.
4. Essentials of Physical Chemistry- B.S. Bahl& G.D. Tuli; S. Chand and Company Ltd.
5. General Chemistry- Ebbing; Houghton Mifflin Company.
6. Organic Chemistry – M. Ahmed &JabbarMian; Mrs. Sufia Ahmed and Mrs. Jahan-Ara Begum.
7. Organic Chemistry- IL Finar; ELBS Longman Group Ltd.
8. Organic Chemistry- Morison & Boyd; Prentice Hall of India.
9. Introduction to Modern Inorganic Chemistry – S.Z. Haider; Friend's International.
10. Modern Inorganic Chemistry – R. D. Madan; S. Chand and Company Ltd.
11. Advanced Inorganic Chemistry – F. Albert Cotton &Geoffey Wilkinson; John Wiley & Sons.

Course Objective:

1. To define the different parameter and concepts of inorganic chemistry.
2. To apply different chemical theory to evaluate structure of molecules.
3. To explain the basic concepts of physical chemistry.
4. To describe basic reaction mechanism of selective organic reactions.

Course Synopsis:

Concepts of atomic structure, Different atom models, Quantum numbers, Electronic configuration, Periodic classification of elements, Periodic properties of elements, Properties and uses of noble gases, Chemical bonding (types, properties, Lewis theory, VBT, MOT), Hybridization and shapes of molecules, Selective organic reactions such as- addition, substitution, oxidation- reduction, alkylation and polymerization, Phase rule, Phase diagram of mono component system.
Solutions and their classification, Unit expressing concentration, Colligative properties of dilute solutions, Thermo chemistry, Chemical kinetics, Chemical equilibrium, pH and buffer solutions, and Electrical properties of solution.

Course Outcomes:

1. Students will be able to define the different parameter and concepts regarding atomic structure, periodic table, chemical bonding, acids and bases.
2. Students will be able to define the different types of solutions.
3. Students will be able to apply different theory on chemical bonding and hybridization to evaluate structure of molecules.
4. Students will be able to classify and explain water pollution and chemistry of halogen, alkali metals, alkaline earth metals, non-metals and heavy metals.
5. Students will be able to explain chemical equilibrium, thermo-chemistry, chemical and ionic equilibria, electrochemical cells.
6. Students will be able to describe basic concepts and basic operations of cements, silicates and limes.

Chem 143: Chemistry-II

3.00 Contact Hour; 3.00 Credit Hour

Text and Ref books:

1. Chemical Process Industries (5th 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.

Course Objectives:

1. A sufficient grasp of the tools required for an in-depth examination of operational considerations such as the connection between product and process
2. The capacity to evaluate theoretical and practical aspects relating to the transfer of the production of chemical products from laboratories to the industrial scale, in accordance with environmental considerations
3. A good command of experimental methodologies in the chemical and industrial fields
4. Tools to support chemical and industrial chemical knowledge, in relation to other scientific and technical fields
5. The advanced knowledge of the fundamentals of industrial chemistry required to enter professions that require a good command of modern scientific methods and techniques.

Course Synopsis:

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.
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.

Course Outcomes:

1. Be able to describe the fundamental scientific principles in the subfields of chemistry (analytical, inorganic, organic and physical), and apply these principles to problems.

2. Be able to explain, integrate and apply relevant knowledge to problems that emerge from the broader interdisciplinary subfields (life, environmental and materials sciences)

3. Be able to identify and describe the underlying principles behind chemical techniques relevant to academia, industry and government.

4. With guidance, be able to apply the methodologies in order to conduct chemical syntheses, analyses or other chemical investigations.

Chem 114: Inorganic Quantitative Analysis Sessional

3.00 Contact Hour; 1.50 Credit Hour

Text and Ref Books:

1. Principles of Physical Chemistry – Haque & Nawab; Students' Publications.
2. Fundamentals of Physical Chemistry- Samuel H. Maron& Jerome B. Lando
3. Physical Chemistry P. W. Atkins; Oxford University Press.
4. Essentials of Physical Chemistry- B.S. Bahl& G.D. Tuli; S. Chand and Company Ltd.
5. General Chemistry- Ebbing; Houghton Mifflin Company.
6. Organic Chemistry – M. Ahmed &JabbarMian; Mrs. Sufia Ahmed and Mrs. Jahan-Ara Begum.
7. Organic Chemistry- IL Finar; ELBS Longman Group Ltd.
8. Organic Chemistry- Morison & Boyd; Prentice Hall of India.
9. Introduction to Modern Inorganic Chemistry – S.Z. Haider; Friend's International.
10. Modern Inorganic Chemistry – R. D. Madan; S. Chand and Company Ltd.
11. Advanced Inorganic Chemistry – F. Albert Cotton &Geoffey Wilkinson; John Wiley & Sons.

Course Objectives:

1. Students will be able to define the different parameters regarding acid and base neutralization, titration and quantitative analysis of metals etc. and others key words like primary standard substances, secondary standard substances, molarity, normality, indicator, equivalent weights and so on.
2. Students will be able to explain the different phenomena regarding iodimetric and iodometric method, complexometric titration etc.
3. Students will be able to estimate zinc, ferrous content in water sample by using various titrimetric methods.
4. Students will be able to summarize a report of any project work and apply in real life.
5. Students will be able to produce lab report with proper appearance, format, grammar, introduction, objective and procedure. Ability to produce lab report with proper results, discussions and conclusion
6. Students will be able to function as an effective team player with the capability to lead in the group project

Course Synopsis:

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

Course Outcomes:

1. Define the different parameters regarding acid and base neutralization, titration and quantitative analysis of metals etc. and others key words like primary standard substances, secondary standard substances, molarity, normality, indicator, equivalent weights and so on.
2. Explain the different phenomena regarding iodimetric and iodometric method, complexometric titration etc.
3. Estimate zinc, ferrous content in water sample by using various titrimetric methods.

Phy 102: Physics Laboratory

3.00 Contact Hour; 1.50 Credit Hours

Text and Ref Books:

1. "Practical Physics" by –Dr. Giasuddin
2. "Practical Physics" by –C.L Arora

Course Synopsis:

Determination of line frequency by Lissajous figures using an oscilloscope and a function generator and verification of the calibration of time/div knob at a particular position for different frequencies; determination of frequency of a tuning fork by Melde's apparatus; determination of the spring constant and the effective mass of a loaded spring; to draw magnetic induction versus current curve for a circular coil using Biot-Savart law and hence to verify tangent law; determination of the moment of inertia of a flywheel about its axis of rotation; determination of rigidity modulus of the material of a wire by static method; determination of the pressure-coefficient of air by constant volume air thermometer; determination of the thermal conductivity of a bad conductor by lee's method; to plot the thermo-electromotive force vs temperature (calibration) curve for a given thermocouple (e5); determination of the melting point of a solid using the calibration curve obtained in experiment-e5; determination of the mechanical equivalent of heat by electrical method; determination of the focal length of (i) a convex lens by displacement method and (ii) a concave lens by an auxiliary lens method; determination of the radius of curvature of a plano-convex lens by Newton's ring method; determination of specific rotation of sugar solution by a polarimeter; to verify Malus' law of polarization; determination of the threshold frequency for the material of a photocathode and hence find the value of the Planck's constant; determination of lattice constant by x-ray.

Course Outcomes:

1. Students will be able to define the different parameters regarding Waves and Oscillations, optics, mechanics, electricity and Heat.
2. Students will be able to explain the different phenomena regarding Waves and Oscillations, optics Mechanics, electricity and Heat
3. Students will be able to set up experiment, conducts experiment, collect data and manage time
4. Students will be able to produce lab report with proper appearance, format, grammar, introduction, objective and procedure. Ability to produce lab report with proper results, discussions and conclusion
5. Students will be able to function as an effective team player with the capability to lead in the group project

Phy 107: Physics-II

3.00 Contact Hour; 3.00 Credit Hour

Text and Ref Books:

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

Course Objectives:

1. To understand different parameters regarding waves and oscillations, optics and thermal physics.
2. To describe different laws and theories related to waves and oscillations, optics and thermal physics.
3. To apply different laws and theories to practical applications.

Course Synopsis:

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.

Course Outcomes:

1. Students will be able to apply the knowledge of defining the different parameters such as periodic motion, simple harmonic motion, damped, undamped oscillations, interference, diffraction, polarization and prism, the different laws of thermodynamics.
2. Students will be able to apply the knowledge of explaining the wave motion for different systems along with energy, the techniques to derive different formula for interference, diffraction, polarization and prism, different theory regarding thermodynamics such as kinetic theory, entropy, Carnot engine etc.
3. Students will be able to solve problems regarding wave motion for different systems, problems regarding interference, diffraction, polarization and prism optical systems, analytical problems regarding thermodynamics related to engineering study

Phy 109: Physics-I

3.00 Contact Hour; 3.00 Credit Hour

Text and Ref Books:

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

Course Objectives:

1. To understand different parameters regarding electricity, magnetism, modern physics and mechanics.
2. To describe different laws and theories related to electricity, magnetism, modern physics and mechanics.
3. To apply different laws and theories to practical applications.

Course Synopsis:

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: electric charges and Coulomb's law. ***The electric field****:* calculation of the electric flux and Gauss' law; some application of Gauss' law, electric potential, relation between electric potential and electric-field; capacitors: Capacitance, dielectrics and atomic view, dielectric and Gauss' law; Current and resistances: current density, ohm's law, resistivity-an atomic view, Ampere's law, Faraday's law; Lenz's law, self-inductance and mutual inductance.

Magnetic properties of matter*:* magneto motive force, magnetic field intensity, permeability, susceptibility; classification of magnetic materials, magnetization curves.

Modern physics: Photoelectric effect, Compton effect, de-Broglie wave, Bohr atomic model, radioactive decay, half-life, mean life, isotopes; nuclear binding energy, alpha, beta, gamma decay.

Theory of relativity: Michelson Morley's experiment, Galilean transformation, Special theory of relativity, Lorentz transformation, relative velocity, Length contraction, Time dilation, mass energy relation,

Course Outcomes:

1. Define different parameters regarding electricity, magnetism, modern physics and mechanics.
2. Demonstrate different laws and theories related to electricity, magnetism, modern physics and mechanics.
3. Analyze different laws and theories to practical applications.
4. Solve different problems associated electricity, magnetism, modern physics and mechanics.

Math 161: Mathematics-I

3.00 Contact Hour 3.00 Credit Hour

Text and Ref Books:

1. A Text Book on Differential Calculus - Mohammad &Bhattacharjee; Students' Publication.
2. Differential Calculus – M. L. Khanna; Joi Prokash Nath and Company.
3. Differential Calculus – Shanti Narayan; S. Chand and Company Ltd.
4. A Text Book on Integral Calculus - Mohammad &Bhattacharjee; Students' Publication.
5. Integral Calculus – Das and Mukherjee; U.N. Dhur and Sons Pvt. Ltd, Calcutta.
6. Integral Calculus – M. L. Khanna; Joi Prokash Nath and Company.

Course Objectives:

The course aims to develop a good conceptual and visual understanding of the fundamentals of the mathematics of differential and the beginning of integral calculus as applied in engineering contexts.

Course Synopsis:

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.

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.

Course Outcomes:

1. Define and solve the problems of the limit, continuity and differentiability of functions.
2. Identify the rate of change of a function with respect to independent variables.
3. Learn the behavior of function.
4. Describe the different techniques of evaluating indefinite and definite integrals.
5. Calculate the length, area, volume, center of gravity and average value related to engineering study.

Math 165: Mathematics-II

4.00 Contact Hour; 4.00 Credit Hour

Text and Ref Books:

1. "College Mathematical Methods" (Vol –II) by — Md. Abdur Rahman
2. "Mathematic Physics" by - B D Gupta
3. "Laplace Transforms" by — Murray R Spiegel (Schaum's Outline Series)
4. "Laplace and Fourier Transforms" by — M. D. Raishanghania.
5. "Complex Variables" by - M L Khanna
6. "Vector Analysis" by - Dr. Muhammad Abdus Sattar
7. "Vector Analysis" by - M. D. Raisinghania
8. "Vector Analysis with applications" by - Md Ali Ashraf and Md Abdul Khaleq Hazra
9. "Vector Analysis" by - Murray R Spiegel (Schaum Series)

Course Objectives:

1. Students will be able to Explain differentiation and integration of vector valued functions in cartesian, cylindrical and spherical geometry.
2. Students will be able to calculation of length, volume and area of objects related to engineering study by using vector
3. Students will be able to apply vector analysis, matrices and coordinate geometry to solve system of liner equations

Course Synopsis:

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. **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.

Course Outcomes:

1. Learn the physical explanation of different vector notation.
2. Explain differentiation and integration of vector valued functions in cartesian, cylindrical and spherical geometry.
3. Calculate length, volume and area of objects related to engineering study by using vector.
4. Find the technique to obtained the inverse matrix that solve the system of linear equations.
5. Understand the nature of the vectors in a vector space.
6. Solve the problems of the pair of straight lines, circles, system of circles, parabola, ellipse etc.
7. Apply the knowledge of geometry in engineering study.

Math 265: Mathematics-III

4.00 Contact Hour; 4.00 Credit Hour

Text and Ref Books:

1. Differential Equation – M.D. Raisinghania
2. Differential Equation -Schaum's Series; McGraw-Hill.

Course Objectives:

1. Partial differential equations allow deterministic mathematical formulations of phenomena in physics and engineering as well as biological processes among many other scenarios.

2. This course is to present the main results in the context of partial differential equations that allow learning about these models and to study numerical methods for the approximation of their solution.

Course Synopsis:

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. Introduction, Linear and nonlinear first order equations. Standard forms of linear equations of higher order, Equation of second order with variable coefficients. Wave equations, Particular solutions with boundary and initial conditions, 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.

Course Outcomes:

1. Identify differential equations of various types
2. Solve different types of differential equations
3. Analyze the classifications of partial differential equations.
4. Apply the boundary value problems in Engineering fields.

Math 267: Mathematics-IV

4.00 Contact Hour; 4.00 Credit Hour

Text and Ref Books:

1. Complex Analysis for Mathematics & Engineering, By J. H. Mathew & Howells,
2. Basic Complex Analysis, by J. E. Marsden
3. Analytic Function Theory, By E. Hille 1974

Course Objectives:

1. To discuss the complex number system, different types of complex functions, analytic properties of complex numbers, theorems in complex analysis to carryout various mathematical operations in complex plane, roots of a complex equation.
2. To discuss limits, continuity, differentiability, contour integrals, analytic functions and harmonic functions.

3. Cauchy–Riemann equations in the Cartesian and polar coordinates, Cauchy's integral formula, Cauchy–Goursat theorem, convergence of sequence and series, Taylor series, Laurents series.
4. 4.Integral transforms with a special focus on Laplace integral transform. Fourier transform

Course Synopsis:

Fourier Analysis: Real and complex form. Finite transform: Fourier Integral. Fourier transforms and their uses in solving boundary value problems.**Complex Variables.** Complex number system, General functions of a complex variable, Limits and continuity of a function of complex variable and related theorems, Complex function, differentiation and the Cruchy-Riemann Equations. Line integral of a complex function, Cauchy's Integral Formula, Liouville's Theorem, Taylor's and Laurent's Theorem, Singular Residues, Cauchy's Residue Theorem.
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.

Course Outcomes:

1. Define the complex number system, complex functions and integrals of complex functions
2. Explain the concept of limit, continuity, differentiability of complex valued functions
3. Apply the results/theorems in complex analysis to complex valued functions
4. Explain the concept of integral transforms, e.g., Laplace, Fourier transforms and the related inverse transforms by using the following Partial fractions method, Tables, Convolution theorems and apply these transformations for engineering.
5. Summarize a report of any project work and apply in real life.

Hum 101: English

2.00 Contact Hour; 2.00 Credit Hour

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 Ellioft Berry.

Course Objectives:

1. To give the students exposure to different types of texts in English in order to make them informed and critical reader.
2. To gain an understanding of the underlying writing well-organized paragraphs and also to teach how to edit and revise their own as well as peer's writing.
3. To teach grammar and vocabulary in a contextualized way.
4. To teach how to write formal letters for a range of academic purposes.
5. To develop skills to communicate effectively and professionally.

Course Synopsis:

Introduction; Importance and Mastering various approaches to learning English; Phonetics - Phonetic systems, correct English pronunciation; Grammatical problems – Grammar and usages; Approaches to communication - communication today, business communication; Methods of Writing - business letter, tenders and quotations, resumes and job letters.

Comprehension, paragraph writing, précis writing, amplification; Report Writing – Purpose of a report, classification of reports, organizing a report, writing short report, preparing complete analytical report, analysis and illustration of a report, problems in writing reports; journal articles, technical and scientific presentation.

Course Outcomes:

1. Organize themselves within the shortest possible time to present their ideas and opinions,
2. Understand and speak English quickly and smartly using the technics learnt in the class
3. Apply the technics to find out the main points of any long article within a very limited time as well as know the technics of any effective writing. In short with consistent practice they will be able to overcome language barrier.

Hum 102: Technical Report Writing and Presentation

1.50 Contact Hour; 0.75 Credit Hour

Text and Ref books:

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

Course Objectives:

1. To improve students' oral communication skills to communicate accurately in various situations;
2. To provide instructions and necessary guideline to practice in general, classroom and real life conversation while engaging students in different kind of speaking activities;
3. To develop students' interpersonal skills engaging them in various group interactions and activities;
4. To help students to overcome their inhibitions, shyness and nervousness in speaking;
5. To practice and improve students' listening skills;
6. To improve students' pronunciation in order to improve their level of comprehensibility in both speaking and listening;
7. To strengthen students' presentation skills to prepare them for different kinds of public speaking;
8. To strengthen students' self-evaluation skills to monitor and develop their own language progress and initiate self-improvement;
9. To encourage a positive attitude towards the language and to develop students' self-confidence.

Course Synopsis:

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 followed by question and answer session. Group presentation or different given topics by the students using power point.

Course Outcomes:

1. Organize themselves within the shortest possible time to present their ideas and opinions,
2. Understand and speak English quickly and smartly using the technics learnt in the class

3. Apply the technics to find out the main points of any long article within a very limited time as well as know the technics of any effective writing. Students will be able to prepare report on any issue and present it in front of others. They will be able to speak fluently on any topic. In short with consistent practice they will be able to overcome language barrier.

Hum 233: Principles of Accounting

2.00 Contact Hour; 2.00 Credit Hour

Text and Ref Book:

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

Course Objectives:

This course aims to provide students with a broad understanding of accounting, the analysis, recording, summarizing, and reporting, and the use of accounting information for decision making, planning, performance measurement and control.

Course Synopsis:

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.
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.

Course Outcomes:

1. Student will be able to demonstrate an understanding of the facts of financial accounting
2. Student will be able to demonstrate an understanding of the facts of cost accounting.
3. Student will be able to apply the accounting concepts to prepare financial statements.

Hum 235: Sociology and Engineering Ethics

2.00 Contact Hour; 2.00 Credit Hour

Text and Ref books:

1. Sociology (4th edition) – Anthony Gidders, Publisher – Excel Media, India.
2. Sociology: Primary Principles – C. N. Shankar Raw, Publisher – S. Chand Co Ltd.
3. Sociology (Rev. ed.) – T. B. Bottomore.
4. Ethics in science and engineering by James G. Speight and Russell Foote.
5. Ethics in engineering practice and research, 2nd ed. by Caroline Whitbeck.

Course Objectives:

1. To teach student the concepts, theories, and methods of the behavioral and social services.
2. To introduce students to the basic social processes of society, social institutions and patterns of social behavior.
3. To enable students to cope effectively with the socio-cultural and interpersonal process of a constantly changing complex society.

Course Synopsis:

Scope of sociology, Industrial revolution, Society and population, Social pathology, Nature of social change, Sociology of development, Urban ecology, Engineering professionalism, ethical decision making, Engineering codes of ethics, Engineering as social experimentation Technology and society, concepts and relations to engineering ethics, the case-study approach to teaching engineering ethics; Bangladesh Studies, Liberation war, Biography of the Father of the nation, Case studies, discussion, debates.

Course Outcomes:

1. Student will be able to identify the nature, scope and perspectives of sociology
2. Student will be able to distinguish between stages of social research and research methods.
3. Student will be able to define socialization and personality development through previous knowledge of perspectives of sociology
4. Student will be able to evaluate social stratification; industrial revolution, capitalism and socialism, culture and civilization; socialization and personality development; globalization; media and individual; social organization and social problem
5. Student will be able to identify the urbanization and city development, changes in society and technology through the knowledge of work and economic life of common individuals, environment and human activities, climate change and global risk, population and human society.

Hum 237: Engineering Economics

2.00 Contact Hour; 2.00 Credit Hour

Text and Ref books:

1. Engineering Economic Analysis, Newnan, Eschenbach, Lavelle. Oxford
2. Principles of Engineering Economic Analysis, White, Case, and Pratt. Wiley & Sons
3. Panneer Selvam, R, “Engineering Economics”, Prentice Hall of India Ltd, New Delhi, 2001
4. Donald.G. Newman, Jerome.P.Lavelle, “Engineering Economics And Analysis” Engg. Press, Texas, 2010

Course Objectives:

1. The objective of this course is to teach the concepts of engineering economic analysis and its role in solving problems.
2. It is designed to provide engineers with the tools needed for rigorous presentation of the effect of the time value of money on engineering decision making.

Course Synopsis:

Cost accounting and time value of money relationships. Analysis of how to calculate the cost of developing and producing products Determining time-based cash flow equivalencies Development of financial statements and ratios Using Monte Carlo simulation to optimize engineering design Stock and Bond Valuation, Comparing mutually exclusive and independent projects. Development of internal rate of return (IRR) and net present value (NPV) Calculation of breakeven points and payback periods Construction of a retirement planner using Monte Carlo simulation, Risk and uncertainty. Calculation of expected NPV and IRR Determining the distribution of NPV and IRR using Monte Carlo simulation Capital Asset Pricing Model (CAPM

Course Outcomes:

1. Define, estimate and analyse engineering project costs
2. Develop, evaluate, and compare engineering project cash flows
3. Formulate and apply interest factors to real life engineering problems
4. Evaluate engineering alternatives by economic analysis techniques and models
5. Discuss and solve advanced economic engineering analysis problems including taxation and inflation

EECE 159: Fundamentals of Electrical Engineering

3.00 Contact Hour; 3.00 Credit Hour

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.

Course Objectives:

1. Understanding basic laws, principles and phenomena in the area of electrical engineering,
2. Theoretical and practical preparation enabling students to apply the acquired knowledge and skills in professional and specialist courses

Course Synopsis:

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.

Course Outcomes:

1. Students will be able to identify the electrical units and standards.
2. Students will be able to identify the measuring instruments like ammeters, voltmeters, watt meters and multi-meter.
3. Students will be able to apply the knowledge of series, parallel, node and mesh current analysis to measure current, voltage and resistance in electrical networks and circuits.
4. Students will be able to apply the concept of AC circuit analysis to find instantaneous current, voltage and power, effective current, voltage and average power.
5. Students will be able to recognize the electrical wiring for residential and commercial loads.
6. Students will be able to recall the basic principles and application of different types of electrical machines (Generator, motor, alternator, transformer) as well as electrical devices with simple application (diodes and rectifiers).

EECE 160: Fundamentals of Electrical Engineering Sessional

1.50 Contact Hour; 0.75 Credit Hour

Text and Ref books:

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

Course Objectives:

1. understanding basic laws, principles and phenomena in the area of electrical engineering,
2. theoretical and practical preparation enabling students to apply the acquired knowledge and skills in professional and specialist courses

Course Synopsis:

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. 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.

Course Outcomes:

1. Employ simple lumped circuit models for resistors, sources, inductors, capacitors, and transistors in circuits.
2. Analyze circuits made up of linear lumped elements. Specifically, analyze circuits containing resistors and independent sources using techniques such as the node method, superposition and the Thevenin method.
3. Students will be able to recognize the electrical wiring for residential and commercial loads.
4. Students will be able to recall the basic principles and application of different types of electrical machines (Generator, motor, alternator, transformer) as well as electrical devices with simple application (diodes and rectifiers).

EECE 259: Electrical and Electronics Technology

3.00 Contact Hour; 3.00 Credit Hour

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.

Course Objectives:

1. To understand the concepts of transformers and their analysis.
2. To suggest a suitable three phase transformer connection for a particular operation.
3. To understand the concepts of generator and to evaluate their performance.
4. To explain the requirement for the parallel operation of transformers and synchronous generators.

Course Synopsis:

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.

Course Outcomes:

1. Demonstrate an understanding of principle of operation and construction of singlephase transformer (core and shell type). Emf equation, transformation ratio, losses, efficiency, voltage regulation and its significance.
2. Demonstrate an understanding of performance of transformers through Illustrative problems and applications of transformer
3. Demonstrate an understanding of principle of operation, types and construction of Induction motors, Slip and its significance.
4. Demonstrate an understanding of applications of squirrel cage and slip ring motors.

EECE 260: Electrical and Electronic Technology Laboratory

3.00 Contact Hour; 1.50 Credit Hour

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.

Course Objectives:

1. To understand the operation and design of transformer coupled various types of power amplifier circuits.
2. To understand the effects of negative feedback on amplifier circuits.
3. To analyze the different RC and LC oscillator circuits to determine the frequency of oscillation

Course Synopsis:

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.

Course Outcomes:

1. Know about different power amplifier circuits, their design and use in electronics and communication circuits.
2. Know the concept of feedback amplifier and their characteristics.
3. Design the different oscillator circuits for various frequencies

CHAPTER 7

COURSE OFFERED BY ME TO STUDENTS OF OTHER DEPARTMENTS

7.1 List of courses offered by ME department to other departments

Course No	Course Name	Level-Term	Dept	Contact Hours	Credit Hours
ME 181	Basic Mechanical Engineering	1-I	CSE	2.0	2.0
Shop 140	Workshop Technology Sessional	1-I	CSE	3.0/2	0.75
ME 263	Fundamentals of Mechanical Engineering	2-I	EECE	3.0	3.0
ME 264	Fundamentals of Mechanical Engineering Sessional	2-I	EECE	3.0	1.5
ME 393	Industrial Management	3-I	EECE	3.0	3.0
Shop 132	Workshop Technology Sessional	1-I	CE	3.0	1.5
Shop 108	Workshop Technology Sessional-I	1-I	AE	0.75	1.5
Shop 112	Workshop Technology Sessional-II	1-II	AE	0.75	1.5
ME 150	Mechanical Engineering Drawing-I	1-I	NAME	3.0	1.5
ME 177	Basic Thermal Engineering	1-I	NAME	3.0	3.0
ME 178	Basic Thermal Engineering Sessional	1-I	NAME	3.0	1.5
Shop 180	Foundry & Welding Shop Sessional	1-I	NAME	1.5	0.75
Shop 190	Machine Shop Sessional	1-I	NAME	1.5	0.75
ME 151	Basic Engineering Thermodynamics	1-I	NSE	3.0	3.0
ME 180	Basic Engineering Drawing	1-I	NSE	3.0	1.5
ME 253	Engineering Mechanics	2-II	NSE	3.0	3.0
ME 254	Engineering Mechanics Sessional	2-II	NSE	1.5	0.75
ME 353	Mechanics of Materials	3-I	NSE	3.0	3.0
ME 354	Mechanics of Materials Sessional	3-I	NSE	1.5	0.75
ME 497	Industrial Management	4-I	NSE	3.0	3.0
Shop 114	Foundry, Welding and Machine Shop	1-I	NSE	3.0	1.5
ME 160	Mechanical Engineering Drawing	1-I	IPE	3.0	1.5
ME 231	Engineering Materials	2-I	IPE	4.0	4.0
ME 232	Engineering Materials Sessional	2-I	IPE	3.0	1.5
ME 243	Mechanics of Solids	2-II	IPE	3.0	3.0
ME 244	Mechanics of Solids Sessional	2-II	IPE	1.50	0.75

ME 251	Thermodynamics and Heat Transfer	2-II	IPE	3.0	3.0
ME 252	Thermodynamics and Heat Transfer Sessional	2-II	IPE	3.0	1.5
ME 271	Engineering Mechanics and Theory of Machines	2-I	IPE	3.0	3.0
ME 351	Fluid mechanics and Machinery	3-I	IPE	3.0	3.0
ME 352	Fluid Mechanics and Machinery Sessional	3-I	IPE	3.0	1.5
Shop 172	Machine Shop	1-I	IPE	1.5	0.75
ME 176	Workshop Practice	1-I	PME	3.0	1.5
ME 178	Engineering Drawing	1-I	PME	3.0	1.5
ME 273	Engineering Thermodynamics	2-I	PME	3.0	3.0
ME 274	Engineering Thermodynamics Sessional	2-I	PME	1.5	0.75
ME 275	Fluid Mechanics	2-II	PME	3.0	3.0
ME 276	Fluid Mechanics Sessional	2-II	PME	1.5	0.75
ME 317	Heat and Mass Transfer	3-II	PME	3.0	3.0
ME 318	Heat Transfer Laboratory	3-II	PME	1.5	0.75
Shop 142	Workshop Practice	1-II	EWCE	1.5	3.0
ME 311	Building Services Engineering-Mechanical Equipment	3-I	Arch	2.0	2.0

ANNEXURE

ANNEX-A

Program Outcomes

PO Number	Program Outcomes
PO1	Apply the knowledge of mathematics, science, and engineering concepts to design, analyze and evaluate mechanical members and systems and to solve complex engineering problems.
PO2	Identify, analyze the complex mechanical engineering problems including thermal, manufacturing and industrial systems to formulate design requirements using mathematical principles.
PO3	Design, implement and evaluate mechanical systems and processes that satisfy specified requirements with appropriate considerations for the public health, safety, cultural, societal, and environmental issues.
PO4	Use research based knowledge and research methods to design and conduct experiments using domain knowledge and analyze data to arrive at valid conclusions.
PO5	Apply recent techniques, skills, knowledge and computer based methods and tools to develop mechanical systems with an understanding of limitations.
PO6	Analyze the local and global impact of modern technologies on individual organizations, society and culture.
PO7	Apply knowledge of current issues to investigate and solve problems with a concern for sustainability and eco-friendly environment.
PO8	Exhibit responsibility in professional ethics, legal, safety and social issues
PO9	Function efficiently in teams, in diverse and multidisciplinary fields to achieve common goals.
PO10	Communicate effectively in diverse groups and Exhibit leadership qualities.
PO11	Apply management knowledge and skills to handle projects in multidisciplinary environment.
PO12	Pursue lifelong learning as a means to enhance knowledge and skills

ANNEX-B

Grading Policy

Numeric Grade	Letter Grade	Grade Point
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
Less than 40%	F	0.00

ANNEX-C

Assessment Method

For Theory Courses:

Assessment Method	(100%)
Class Assessment	
Class Performance	**05**
Mid-Term Assessment (Exam/Project)	**15**
Class Test/Assignment	**20**
Exam	
Final exam	**60**

For Sessional Courses:

Assessment Method	**(100%)**
Class Assessment	
Conduct of Lab Tests/Class Performance	**25%**
Report Writing/Programming	**15%**
Mid-Term Evaluation (exam/project/assignment)	**20%**
Final Evaluation (exam/project/assignment)	**30%**
Viva Voce/Presentation	**10%**
Total	**100%**