DEPARTMENT OF MECHANICAL ENGINEERING
SONARGAON UNIVERSITY (SU), DHAKA

FACULTY: SCIENCE AND ENGINEERING

PROGRAM: B.Sc. in Mechanical Engineering

PROPOSED REVISED OBE SYLLABUS BY
Departmental Syllabus Committee (ACUG) and recommended by 24th Academic Council (dated: 16-06-2022) for the approval of UGC

Duration (minimum): 4-Year (8 Semesters)

Maximum Period of Completion of the Program: 6 (six) Years

Admission Requirements: SU-rules or as suggested by UGC (See Art. 17-b)

Academic Calendar:

The academic year shall be divided into two regular Semesters (1st/Spring and 2nd/Fall Semesters), each ordinarily having duration of not less than 14 (fourteen) weeks of classes. There shall be a Mid-Semester Examination at about middle of each Semester and a Semester Final Examination at the end of each Semester. The examination will be conducted as per Academic regulations.

Guide line for Classes and Examinations in a Semester:

Total Class in a Semester: 14 weeks
Recess before Mid-Semester and Semester Final Exams. = 2 weeks
Time for Mid-Semester and Semester Final Exams. = about 4 weeks
Publication of Results + Inter-Semester Recess = 2 weeks

Minimum Requirements for the Degree:

(i) Completion of 160.00 credits.
(ii) Passing all courses individually and maintaining a minimum CGPA of 2.25 out of 4.00.

Evaluation System: Continuous Assessment = 30%
Mid-Semester Exam. = 30%
Semester Final Exam. = 40%

***Continuous Assessment* = Class Tests + Assignments/Quiz + Attendance and Class Performance.**

Grading System:

Numerical grade	Letter Grade	Grade point
80% or above	A+ (A plus)	4.00
75% to less than 80%	A	3.75
70% to less than 75%	A- (A minus)	3.50
65% to less than 70%	B+ (B plus)	3.25
60% to less than 65%	B	3.00
55% to less than 60%	B- (B minus)	2.75
50% to less than 55%	C+ (C plus)	2.50
45% to less than 50%	C	2.25
40% to less than 45 %	D	2.00
Less than 40%	F	0.00

Course Designation and Course Code Numbering Systems:

Each course is designated by a two to four letter code (e.g. CE, EEE, ME, CSE, Arch, NAME, LAW, Hum, Math, Chem, Phy, Ban, etc.) identifying the course offering department or program followed by a four digit numbers with the following criteria:

(i) ME defines the departmental Code of Mechanical Engineering.

(ii) The first digit will correspond to the Year (e.g. 1 for 1st year, 2 for 2nd year, 3 for 3rd year, etc.) in which the students normally take the course.

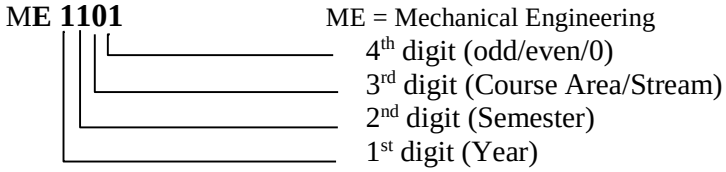
(iii) The second digit will correspond to the Semester (1 for 1st semester and 2 for 2nd semester) in which the course is normally taken by the students.

(iv) The third digit will correspond the departmental course of any area/stream.

(v) The fourth or last digit designates the course type (odd digit for theory, even digit for sessional/design studio and 0 digit for the sessional course without theory course).

(vi) There is a blank space between departmental code (such as ME, EEE, CE, Math, Hum) and first digit (viz. ME 1101, Hum 1101).

Example for a Typical Course Code No.:



N.B.:(1) Project & Thesis/Thesis/Dissertation course should be designated by the departmental identification code followed by 4000 (viz. ME 4000) for 4-year Engineering Programs applicable for last two semesters.

(2) Teaching for the courses is reckoned in credits and the credits allotted to various courses will be determined by the ACUG (Academic Committee of Undergraduate) with the following guidelines:

Sl.	Type of Course	Contact Hour/week	Credit
(i)	Theory/Lecture (Taught)/ Seminar (Discussion)	1.0	1.00
(ii)	Tutorial/ Practice/Technical Systems	1.0	1.00
(iii)	Independent Lab/Sessional/Design/ Special Study Elective (Studio)	1.5 2.0	0.75 1.00
(iv)	Project & Thesis/Thesis/ Dissertation	2.0	1.00
(v)	Design Studio	1.5	1.00
(vi)	Field Work/Field Survey	2 weeks of field work	1.00
(vii)	Industrial Attachment (after completion of all courses)	One to Three months	As per approved by UGC
(viii)	Internship (after completion of all courses)	As per approved by UGC	As per approved by UGC
(ix)	Internship (within study period) #	As per approved by UGC	Non-credit (For B. Arch)

N.B.: *1.0 contact hour = Lecture of 50 minutes.*

Outcome-Based Curriculum

Part A

1. **Title of the Academic Program:** B. Sc. in Mechanical Engineering
2. **Name of the University:** Sonargaon University (SU)
3. **Vision of the University:**

To become a Center of Excellence comparable to the best in the world for producing professionals who shall be leaders in technology, innovation, entrepreneurship and management.

4. **Mission of the University:**

Mission 1: The Sonargaon University's mission as a young research university is to achieve the highest standards of international excellence in research and teaching, while also fully meeting its distinctive responsibilities as the country's sole private institution of higher education.
Mission 2: The University students and staff have the opportunity to develop the skills, judgement and independence necessary to be engaged citizens and to assume active leadership roles in societal and economic life.
Mission 3: The production of knowledge, which will always remain the prime mission of a university, implies creativity enhancing conditions allowing a focus on the essentials, as it needs the freedom to experiment and to devise innovative, special and disruptive solutions.
Mission 4: It provides a unique forum for the development of the cultural, political and social dialogues that are the lifeblood of a mature democracy.
Mission 5: The University develops activities in fields that contribute to priority areas of national social and economic development, for the benefit of the competitiveness of Bangladesh.

5. **Name of the Program Offering Entity:** Department of Mechanical Engineering, Faculty of Science and Engineering

6. **Vision of the Program Offering Entity:**

Through the active participation of its people, Mechanical engineering department will be acknowledged as a leader of its discipline, which illustrates quality education, research and innovation. With quality education and research, department will enable to create skill and well qualified engineers to meet the continually changing technological, regional and national needs.

7. **Mission of the Program Offering Entity:**

The mission of the Department of Mechanical engineering is to provide knowledge to the students in the science and technology through world class education and innovative research so that they able to make impactful contribution to society, nation and world and to develop professional potential and skill of faculty, staff and students by maintaining training and educational program by which they can achieve lifelong ability for constructing their professional careers.

8. Objectives of the Program Offering Entity:

- To provide the basic knowledge, theories, principle, process and procedure of the main area of mechanical engineering.
- To make the students ready for becoming leader of our society by teaching, inspiring and counseling to face the challenges of world-wide economy in 21st century.
- To prepare the student to be able to demonstrate analytical and critical thinking skills to solve the contextual and numerical problems of mechanical engineering,
- To familiarize the students with moral and ethical values to handle the research finding and maintaining secrecy of development of patriotism.
- To boost up innovative and creative thinking in promising mechanical engineer to face the challenges of the forthcoming.

9. Name of Degree: B. Sc. in Mechanical Engineering

10. Description of the Program

The department of Mechanical Engineering offers four-year undergraduate program titled Bachelor of Science (B. Sc.) in Mechanical Engineering. The curriculum will equip the students with the skills they need to successfully carry out essential responsibilities including raising the standard of living in civilized communities. The automotive, train, aircraft, and ship industries, power plants, air-conditioning systems, robots, heating/cooling systems, and other modern systems are studied by mechanical engineers. Numerous sub-branches of mechanical engineering were created to explore the aforementioned application fields, including manufacturing and construction, thermodynamics, energy, machine theory, and dynamics. By giving the students the most recent information on the subjects of mechanical engineering, this department hopes to educate engineers who can work with contemporary technology and promote the growth of the manufacturing industry.

11. Graduate Attributes

Graduate Attributes related to core knowledge:

- Engineering knowledge
- Problem analysis
- Design/development of solutions
- Conduct investigations of complex problems

Graduate Attributes related to Skills:

- Modern tool usage
- Environment and sustainability
- Communication
- Project management and finance

Graduate Attributes related to behavior

- Ethics
- The engineer and society
- Individual and team work
- Lifelong learning

12. Program Educational Objectives (PEOs)

PEO 1: To make graduates of the Mechanical Engineering program capable of contributing towards Nation's development through their ability to solve diverse and complex industrial problems across a broad range of design and production.

PEO 2: To transform graduates of the Mechanical Engineering program into successful professionals who are able to pursue their career in government services, research organizations, industries, and are adaptable for higher education, entrepreneurship, and professional development.

PEO 3: To enable graduates of the Mechanical Engineering program for adapting to changing scenarios of dynamic technology with potential to solve larger societal problems using a coherent and flexible approach in decision making.

PEO 4: Prepare competent Mechanical Engineers knowledgeable and skillful who are able to stimulate and conduct complex research and develop new technologies.

13. Program Learning Outcomes (PLOs)

PLO 1: Ability to gather and apply knowledge of mathematics, science, and engineering

PLO 2: Ability to identify, create, and solve engineering problems

PLO 3: Ability to design, analyze and develop computing systems within realistic constraints

PLO 4: Ability to conduct, evaluate, and interpret experiments

PLO 5: Apply appropriate techniques, resources, modern engineering and IT tools

PLO 6: Ability to understand the impact of engineering solutions

PLO 7: Ability to design Civil and structural projects with in social constraints.

PLO 8: Practice behaving professionally and ethically

PLO 9: Ability to work on multidisciplinary teams and develop leadership

PLO 10: Ability to communicate effectively on complex engineering activities

PLO 11: Demonstrate knowledge and understand principles of engineering and management to manage projects

PLO 12: Able to engage in Lifelong learning

14. Mapping mission of the university with PEOs

PEOs	Mission 1	Mission 2	Mission 3	Mission 4	Mission 5
PEO 1	√				
PEO 2		√	√		
PEO 3	√			√	
PEO 4		√			√

15. Mapping PLOs with PEOs

PLOs	PEO1	PEO2	PEO3	PEO4
PLO 1	√	√		
PLO 2			√	
PLO 3	√		√	
PLO 4	√			√
PLO 5		√		√
PLO 6	√	√		
PLO 7	√			√
PLO 8		√		
PLO 9			√	
PLO 10		√		√
PLO 11	√		√	√
PLO 12			√	

16. Mapping Courses with PLOs

Course Code	Course Title	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10	PLO 11	PLO 12
ME 1101	Basic Mechanical Engineering	√		√	√	√			√		√	√	√
Phy 1101	Physics I	√		√	√	√	√	√			√	√	√
Chem 1101	Engineering Chemistry	√	√	√	√	√	√	√	√	√	√	√	√
Math 1101	Mathematics I	√	√	√		√			√				√
Ban 1101	Bengali Language and Literature	√	√			√					√		√
ME 1100	Mechanical Engineering Drawing I	√	√	√	√	√	√	√	√	√	√	√	√
Phy 1102	Physics I Sessional	√	√	√	√	√	√		√		√	√	√
Shop 1100	Foundry and Welding Shops	√		√		√		√	√	√	√		√
Chem 1102	Inorganic Quantitative Analysis	√	√	√	√	√			√	√	√	√	√
Hum 1201	English Language			√	√		√	√	√	√			√
Hum 1203	History of Bangladesh Independence		√	√	√		√						
EEE 1201	Electrical Engineering and Electronics Technology	√	√	√	√	√	√	√	√	√	√	√	√
Math 1201	Mathematics II	√		√		√			√		√		√
CSE 1201	Computer Programming Language	√	√	√	√	√	√	√	√		√	√	√
Hum 1202	English Language Sessional	√	√						√	√	√		
EEE 1202	Electrical Engineering Sessional	√	√	√	√	√	√	√	√	√	√	√	√

CSE 1202	Computer Programming Language Sessional	√	√	√	√	√	√	√	√		√	√	√
Shop 1200	Machine Shop Practices	√		√	√	√		√			√		
ME 2101	Engineering Mechanics I	√	√	√	√	√	√	√	√	√	√	√	√
Math 2101	Mathematics III	√	√	√		√			√		√		
Phy 2101	Physics II	√	√	√	√	√		√	√		√		√
ME 2103	Numerical Analysis for Engineers	√	√	√	√	√		√	√		√		
Hum 2101	Environmental Protection		√				√	√	√				√
Hum 2103	Engineering Economics	√		√	√	√	√	√	√	√	√		√
ME 2100	Mechanical Engineering Drawing II	√		√	√	√		√	√	√	√	√	√
EEE 2102	Electronics Technology Sessional	√	√	√	√	√	√	√	√	√	√	√	√
ME 2104	Numerical Analysis Sessional	√	√	√	√	√		√	√	√	√	√	
ME 2201	Engineering Mechanics II	√		√	√	√		√	√		√	√	
ME 2203	Metallic Materials	√		√	√	√		√	√		√	√	√
ME 2205	Engineering Thermodynamics	√	√	√		√		√	√			√	
Math 2201	Mathematics IV	√		√	√	√		√			√		
ME 2207	Mechanics of Solids	√	√	√	√	√	√	√	√		√	√	√
Hum 2201	Sociology and Accounting	√	√			√	√						
ME 2204	Metallic Materials Sessional	√	√	√	√	√			√		√	√	√
ME 2206	Engineering Thermodynamics Sessional	√	√	√		√		√	√			√	
ME 2208	Mechanics of Solid Sessional	√	√	√	√	√	√	√	√		√	√	√
ME 3101	Heat and Mass Transfer	√	√	√	√	√	√	√	√	√	√	√	√
ME 3121	Fluid Mechanics I	√		√		√			√		√		
ME 3141	Mechanics of Machinery	√		√	√	√			√		√	√	√
ME 3143	Instrumentation and Measurement	√	√	√	√	√	√	√		√	√	√	√
Hum 3161	Engineering Ethics and Professionalism				√		√	√		√			√
ME 3102	Heat and Mass Transfer Sessional	√	√	√	√	√	√	√	√	√	√	√	√
ME 3122	Fluid Mechanics I Sessional	√		√		√			√		√		
ME 3142	Mechanics of Machinery Sessional	√	√	√	√	√	√	√	√	√	√	√	√
ME 3144	Instrumentation and Measurement Sessional	√		√		√		√	√				

ME 3203	Power Plant Engineering	√	√	√	√	√	√	√	√	√	√	√	√
ME 3223	Fluid Mechanics II	√	√	√	√	√	√	√	√	√	√	√	√
ME 3243	Machine Design		√			√	√				√	√	
IPE 3231	Manufacturing Processes	√	√				√	√					
IPE 3201	Industrial Management	√	√	√	√	√	√	√	√	√	√	√	√
ME 3224	Fluid Mechanics II Sessional	√		√	√	√		√	√		√	√	
ME 3244	Machine Design Sessional	√		√				√					√
IPE 3232	Manufacturing Process Sessional	√	√	√	√	√	√	√	√	√	√	√	√
ME 4101	Internal Combustion Engine	√	√	√	√	√	√	√	√	√	√	√	√
ME 4123	Fluid Machinery	√	√	√	√	√	√	√		√	√	√	√
IPE 4103	Measurement and Quality Control	√		√		√			√			√	√
ME 4105	Refrigeration and Building Mechanical System	√	√	√				√			√		√
ME 4107	Renewable Energy	√	√			√			√	√	√		√
ME 4109	Aerodynamics	√		√	√	√		√	√		√	√	
ME 4111	Robotics	√			√		√		√	√		√	√
ME 4113	Control Engineering	√	√	√	√	√	√		√	√	√		
ME 4115	Petroleum Engineering	√	√	√	√	√	√	√	√	√	√	√	√
ME 4117	Noise and Vibration	√	√			√		√			√	√	
ME 4119	Mechatronics	√	√	√	√	√	√	√	√	√	√	√	√
ME 4102	Heat Engines Sessional	√	√	√	√	√			√		√	√	√
ME 4124	Fluid Machinery Sessional	√	√	√	√	√			√		√	√	√
IPE 4104	Measurement and Quality Control Sessional	√	√	√	√	√			√		√	√	√
ME 4201	Automobile Engineering	√	√	√		√		√	√	√	√	√	√
IPE 4205	Machine Tools	√	√	√	√	√	√	√	√		√	√	√
ME 4205	Energy & Environment	√	√				√	√				√	
ME 4207	Composite Materials			√		√		√			√	√	√
ME 4209	Flight Dynamics	√		√		√			√		√		√
ME 4211	Bioengineering		√				√	√	√				√
ME 4213	Nuclear Engineering		√				√	√	√				√
ME 4215	Gas Dynamics	√	√			√			√	√	√		√
ME 4217	Fluidics	√		√	√	√			√		√		
ME 4219	Design of Fluid Machines	√	√	√	√	√			√		√	√	√
EEE 4221	Electrical Machines	√	√	√		√		√	√				

ME 4204	Steam Laboratories Sessional	√	√	√	√	√			√		√	√	√
IPE 4206	Machine Tools Sessional	√	√	√	√	√	√	√	√	√	√	√	√
ME 4000	Project and Thesis	√		√		√						√	√

Part B

17. Structure of the curriculum:

a) Duration of the program: Years: 4 Semester: 8

b) Admission Requirements:

(i) General Academic Qualifications for Admission to Different Departments/Programs:

- A student should have at least second division or minimum GPA 3.00 in both SSC/O-Level or equivalent and HSC/A-Level or equivalent examinations. If minimum GPA is 2.00 in any of the examinations, then total GPA of both SSC/O-Level or equivalent and I-ISC/A-Level or equivalent examinations must be 6.00.

  (OR) Minimum CGPA of 2.5 in O-Level in five subjects and A-Level in two subjects separately, according to the scale (A=5, B=4, C =3 and D 2). Subjects with E-grade will not be considered.

  (OR) In case of freedom fighter's Quota total GPA in both SSC/O-Level or equivalent and HSC/A-Level or equivalent examinations must be 5.00.

  (OR) In case of Music, Fashion Design, Fine Arts, Graphic Design, Library Science and Information program/courses minimum GPA in both SSC/O-Level or equivalent and HSC/A-Level or equivalent examinations must be 2.00.
- Any candidate of Arts and Commerce in HSC/A-level or equivalent will not be allowed to submit application for Engineering and Architecture departments/programs.
- For the programs of Eng. and Arch, the candidates must pass in Physics, Chemistry and Mathematics at HSC/A-level or equivalent examinations.
- Candidate of GED diploma holders will not be allowed for admission.

  However, the candidate must also fulfil all other requirements as may be prescribed by the Academic Council on the recommendation of the Admission Committee. In case of confusion regarding the equivalence the case may be referred to Central Equivalence Committee.

(ii) The rules and conditions for admission into different departments/programs shall be framed by the Academic Council on the recommendation of the Admission Committee in each year (if modification is required).

(iii) All candidates for admission in any department/program must be citizens of Bangladesh unless the candidature is against the seats those are reserved for foreign students. Candidates for all seats except the reserved ones, if any, shall be selected on the basis of merit. The rules for admission into the reserved seats shall be framed by the Academic Council on the recommendation of the Admission Committee.

(iv) No student shall ordinarily be admitted in the first year class after the start of the corresponding classes or after the call goes out for the admission whichever is later. The date of commencement of classes for the newly admitted students will be announced in advance.

(v) Prior to admission to the University every student shall be examined by a competent medical officer as prescribed in the admission rules.

c) Total minimum credit requirement to complete the program: 160.00

d) Total class weeks in a semester: 14 weeks

e) **Minimum CGPA requirements for graduation:** 2.25

f) Maximum academic years of completion: 6 (six) years

g) Category of Courses:

Categories of Courses	Required Credits
A. Language & General Education	17.00
B. Basic Science	12.00
C. Mathematics	12.00
D. Allied Engineering	27.00
E. Mechanical Engineering (Core Courses)	74.00
F. Mechanical Engineering (Optional Courses)	12.00
G. Project & Thesis	06.00
Total	160.00

18. SEMESTER-WISE SUMMARY OF COURSES TO BE OFFERED

1st Year 1st Semester

Sl.	Course Code	Course Title	Theory		Sessional		Total Credits
			Contact hrs/week	Credits	Contact hrs/week	Credits	
1	ME 1101	Basic Mechanical Engineering	3.0	3.00	--	--	3.00
2	Phy 1101	Physics I	3.0	3.00	--	--	3.00
3	Chem 1101	Engineering Chemistry	3.0	3.00	--	--	3.00
4	Math 1101	Mathematics I	3.0	3.00	-	-	3.00
5	Ban 1101	বাংলা ভাষা ও সাহিত্য (Bengali Language and Literature)	2.0	2.00	--	--	2.00
6	ME 1100	Mechanical Engineering Drawing I	--	--	3.0	1.50	1.50
7	Phy 1102	Physics I Sessional			3.0	1.50	1.50
8	Shop 1100	Foundry and Welding Shops	--	--	2.0	1.00	1.00
9	Chem 1102	Inorganic Quantitative Analysis	--	--	3.0	1.50	1.50
		Total	**14.0**	**14.00**	**11.0**	**5.50**	**19.50**

Contact hours: 14.0 (T) + 11.0 (S) = 25.0 hrs/week
Total credits: 19.50

No. of theory courses : 5
No. of sessional courses: 4

N.B.: Any student of 4-year diploma in engineering, willing to obtain exemption of the courses of 1st Year 1st Semester, will have to submit an application to the Head of the concerned Department for approval.

1st Year 2nd Semester

Sl.	Course Code	Course Title	Theory		Sessional		Total Credits
			Contact hrs/week	Credits	Contact hrs/week	Credits	
1	Hum 1201	English Language	3.0	3.00	-	-	3.00
2	Hum 1203	বাংলাদেশের অভ্যুদয়ের ইতিহাস (History of Bangladesh Independence)	2.0	2.00	-	-	2.00
3	EEE 1201	Electrical Engineering and Electronics Technology	4.0	4.00	-	-	4.00
4	Math 1201	Mathematics II	3.0	3.00	-	-	3.00
5	CSE 1201	Computer Programming Language	3.0	3.00	-	-	3.00
6	Hum 1202	English Language Sessional			1.5	0.75	0.75
7	EEE 1202	Electrical Engineering Sessional	--	--	1.5	0.75	0.75
8	CSE 1202	Computer Programming Language Sessional	--	--	3.0	1.50	1.50
9	Shop 1200	Machine Shop Practices	--	--	2.0	1.00	1.00
		Total	**15.0**	**15.00**	**10.00**	**4.00**	**19.00**

Contact hours: 15.0 (T) + 10.0 (S) = 25.0 hrs/week
Total credits: 19.50

No. of theory courses : 5
No. of sessional courses: 4

2nd Year 1st Semester

Sl.	Course Code	Course Title	Theory		Sessional		Total Credits
			Contact hrs/week	Credits	Contact hrs/week	Credits	
1	ME 2101	Engineering Mechanics I	3.0	3.00	--	--	3.00
2	Math 2101	Mathematics III	3.0	3.00	--	--	3.00
3	Phy 2101	Physics II	3.0	3.00	--	--	3.00
4	ME 2103	Numerical Analysis for Engineers	3.0	3.00	--	--	3.00
5	Hum 2101	Environmental Protection	2.0	2.00	--	--	2.00
6	Hum 2103	Engineering Economics	2.0	2.00	--	--	2.00
7	ME 2100	Mechanical Engineering Drawing II	--	--	3.0	1.50	1.50
8	EEE 2102	Electronics Technology Sessional	--	--	1.5	0.75	0.75
9	ME 2104	Numerical Analysis Sessional	--	--	3.0	1.50	1.50
		Total	**16.0**	**16.00**	**7.5**	**3.75**	**19.75**

Contact hours: 16.0 (T) + 7.5 (S) = 23.5 hrs/week
Total credits: 19.75

No. of theory courses : 6
No. of sessional courses: 3

2nd Year 2nd Semester

Sl.	Course Code	Course Title	Theory		Sessional		Total Credits
			Contact hrs/week	Credits	Contact hrs/week	Credits	
1	ME 2201	Engineering Mechanics II	3.0	3.00	--	--	3.00
2	ME 2203	Metallic Materials	3.0	3.00	--	--	3.00
3	ME 2205	Engineering Thermodynamics	3.0	3.00	--	--	3.00
4	Math 2201	Mathematics IV	3.0	3.00	--	--	3.00
5	ME 2207	Mechanics of Solids	3.0	3.00	--	--	3.00
6	Hum 2201	Sociology and Accounting	3.0	3.00	--	--	3.00

7	ME 2204	Metallic Materials Sessional	--	--	1.5	0.75	0.75
8	ME 2206	Engineering Thermodynamics Sessional	--	--	1.5	0.75	0.75
9	ME 2208	Mechanics of Solid Sessional	--	--	2.0	1.00	1.00
		Total	**18.0**	**18.00**	**5.0**	**2.50**	**20.50**

Contact hours: 18.0 (T) + 5.0 (S) = 23.0 hrs/week
Total credits: 20.50
No. of theory courses : 6
No. of sessional courses: 3

3rd Year 1st Semester

Sl.	Course Code	Course Title	Theory		Sessional		Total Credits
			Contact hrs/week	Credits	Contact hrs/week	Credits	
1	ME 3101	Heat and Mass Transfer	4.0	4.00	--	--	4.00
2	ME 3121	Fluid Mechanics I	3.0	3.00	--	--	3.00
3	ME 3141	Mechanics of Machinery	4.0	4.00	--	--	4.00
4	ME 3143	Instrumentation and Measurement	3.0	3.00	--	--	3.00
5	Hum 3161	Engineering Ethics and Professionalism	2.0	2.00	--	--	2.00
6	ME 3102	Heat and Mass Transfer Sessional	--	--	3.0	1.50	1.50
7	ME 3122	Fluid Mechanics I Sessional	--	--	1.5	0.75	0.75
8	ME 3142	Mechanics of Machinery Sessional	--	--	3.0	1.50	1.50
9	ME 3144	Instrumentation and Measurement Sessional	--	--	3.0	1.50	1.50
		Total	**16.0**	**16.00**	**10.5**	**5.25**	**21.25**

Contact hours: 16.0 (T) + 10.5 (S) = 26.5 hrs/week
Total credits: 21.25
No. of theory courses : 5
No. of sessional courses: 4

3rd Year 2nd Semester

Sl.	Course Code	Course Title	Theory		Sessional		Total Credits
			Contact hrs/week	Credits	Contact hrs/week	Credits	
1	ME 3203	Power Plant Engineering	3.0	3.00	--	--	3.00
2	ME 3223	Fluid Mechanics II	3.0	3.00	--	--	3.00
3	ME 3243	Machine Design	4.0	4.00	--	--	4.00
4	IPE 3231	Manufacturing Processes	3.0	3.00	--	--	3.00
5	IPE 3201	Industrial Management	3.0	3.00	--	--	3.00
6	ME 3224	Fluid Mechanics II Sessional	--	--	2.0	1.00	1.00
7	ME 3244	Machine Design Sessional	--	--	3.0	1.50	1.50
8	IPE 3232	Manufacturing Process Sessional	--	--	2.0	1.00	1.00
		Total	**16.0**	**16.00**	**7.0**	**3.50**	**19.50**

Contact hours: 16.0 (T) + 7.0 (S) = 22.0 hrs/week
Total credits: 19.50
No. of theory courses : 5
No. of sessional courses: 3

4th Year 1st Semester

Option	Course Code	Course Title	Theory		Sessional		Total Credits
			Contact hrs/week	Credits	Contact hrs/week	Credits	
C	ME 4101	Internal Combustion Engine	3.0	3.00	--	--	3.00
C	ME 4123	Fluid Machinery	3.0	3.00	--	--	3.00
C	IPE 4103	Measurement and Quality Control	3.0	3.00	--	--	3.00
C	ME 4105	Refrigeration and Building Mechanical System	3.0	3.00	--	--	3.00
Option I	ME 41XX	Select one course from Option I	3.0	3.00	--	--	3.00
C	ME 4102	Heat Engines Sessional	--	--	1.5	0.75	0.75
C	ME 4124	Fluid Machinery Sessional	--	--	2.0	1.00	1.00
C	IPE 4104	Measurement and Quality Control Sessional	--	--	2.0	1.00	1.00
C	ME 4000	Project and Thesis	--	--	6.0	3.00	*3.00
		Total	**15.0**	**15.00**	**11.5**	**5.75**	**20.75**

Contact hours: 15.0 (T) + 11.5 (S) = 26.5 hrs/week
Total credits: 20.75, C = Compulsory

No. of theory courses : 5
No. of sessional courses: 4

*** This credit in addition to 3.00 credits of 4th year 2nd semester for project & thesis will be assessed at the end of 4th Year 2nd Semester.**

4th Year 2nd Semester

Option	Course Code	Course Title	Theory		Sessional		Total Credits
			Contact hrs/week	Credits	Contact hrs/week	Credits	
C	ME 4201	Automobile Engineering	3.0	3.00	--	--	3.00
C	IPE 4205	Machine Tools	3.0	3.00	--	--	3.00
Option II	ME 42XX	Select 3 courses from Option II	3.0	3.00	--	--	3.00
	ME 42XX		3.0	3.00	--	--	3.00
	ME 42XX		3.0	3.00	--	--	3.00
C	ME 4204	Steam Laboratories Sessional	--	--	2.0	1.00	1.00
C	IPE 4206	Machine Tools Sessional	--	--	1.5	0.75	0.75
C	ME 4000	Project and Thesis	--	--	6.0	3.00	3.00
		Total	**15.0**	**15.00**	**9.5**	**4.75**	**19.75**

Contact hours: 15.0 (T) + 4.75 (S) = 19.75 hrs/week
Total credits: 19.75, C = Compulsory

No. of theory courses : 5
No. of sessional courses: 3

OPTIONAL I

Course Code	Course Title	Contact hrs/week	Credits
ME 4107	Renewable Energy	3.0	3.00
ME 4109	Aerodynamics	3.0	3.00
ME 4111	Robotics	3.0	3.00
ME 4113	Control Engineering	3.0	3.00
ME 4115	Petroleum Engineering	3.0	3.00
ME 4117	Noise and Vibration	3.0	3.00
ME 4119	Mechatronics	3.0	3.00

OPTIONAL II

Course Code	Course Title	Contact hrs/week	Credits
ME 4205	Energy & Environment	3.0	3.00
ME 4207	Composite Materials	3.0	3.00
ME 4209	Flight Dynamics	3.0	3.00
ME 4211	Bio-Engineering	3.0	3.00
ME 4213	Nuclear Engineering	3.0	3.00
ME 4215	Gas Dynamics	3.0	3.00
ME 4217	Fluidics	3.0	3.00
ME 4219	Design of Fluid Machines	3.0	3.00
EEE 4221	Electrical Machines	3.0	3.00

PART C

19. Description of all courses of the program including the following information for each course:

ME 1101: Basic Mechanical Engineering
Credits: 3.0 ***Contact hours: 3.0 hrs/week***

Rationale of the Course:

Mechanical engineering plays a critical role in manufactured technologies, from cars to airplanes to refrigerators. It enables you to do many daily activities with ease, as it brings helpful technologies to our modern society. The basic courses are statics, dynamics, thermodynamics, heat transfer, systems design, and computational engineering. It is one of the most important subdivisions of engineering, because without it, many of the technologies we use every day would not be available

Course Content:

Study of sources of energy: conventional and renewable, environmental pollution; study of steam generation units with their accessories and mountings; Introduction to steam turbine with their accessories, internal combustion engines and gas turbines with their accessories, automobiles; Introduction to pumps, blowers and compressors, refrigeration and air–conditioning systems, Introduction to different machine tools and various machining processes.

Course Learning Outcomes (CLOs)

CLO1: To understand the fundamentals of manufacturing processes and the manufacturing technology

CLO2: To know the basic courses are statics, dynamics, thermodynamics, heat transfer, systems design, and computational engineering

CLO3: To apply the knowledge in order to identify the exact mechanical operation needed for a product

Mapping Course Learning Outcomes (CLOs) with the PLOs

Course Learning Outcomes (CLO)	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10	PLO 11	PLO 12
CLO 1	√									√	√	√
CLO 2	√		√	√	√			√		√		
CLO 3	√		√	√	√			√		√		

Mapping Course Learning Outcomes (CLOs) with the Teaching-Leaning & Assessment Strategy

Course Learning Outcomes (CLO)	Teaching-Learning Strategy	Assessment Strategy
CLO 1	PPT, Lecture Notes, Reference Book	Mid Semester Examination, Class Test, Final Examination
CLO 2	PPT, Lecture Notes, Reference Book	Mid Semester Examination, Assignment, Class Test, Final Examination
CLO 3	PPT, Lecture Notes, Reference Book	Mid Semester Examination, Assignment, Class Test, Final Examination

Phy 1101: Physics I

Credits: 3.0 ***Contact hours: 3.0 hrs/week***

Rationale of the Course: This course helps the student to enhance their knowledge on the structure and state of mater, electricity, magnetic properties of matter, theory of relativity. Some important topics of modern physics are also discussed in this course. By acquiring the knowledge from this course, students can increase their analytical skills, quantitative reasoning and problem-solving skills.

Course Content: Solid, liquid, and gas, Classification of solids, Amorphous, Crystalline, Ceramic and Polymers; Plasticity and Elasticity, Atomic arrangement in solid, Different types of bond in solids, Metallic and Vander Waal's, Covalent and ionic bond, Packing factor in solids, Inter atomic distances and forces of equilibrium; X-ray diffraction, Bragg's law, Distinction between metal, Insulator and semiconductor; 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; Magneto motive force, Magnetic field intensity, Permeability, Susceptibility, Classification of magnetic materials, magnetization curves; Photoelectric effect, Compton effect, De-Broglie wave, Bohr atomic model, Radioactive decay, Half-life, Mean life, Isotopes, Nuclear binding energy, Alpha, Beta, Gamma decay, Michelson Morley's experiment, Galilean transformation, Special theory of relativity, Lorentz transformation, Relative velocity, Length contraction, Time dilation, Mass energy relation.

Course Learning Outcomes (CLOs)

CLO1: To understand the fundamentals of matters, electricity and magnetism, modern physics and theory of relativity.

CLO2: To earn a vast knowledge on electricity including different kinds of laws and circuit design.
CLO3: To share their knowledge with others by team work. Because this develops their learning capability.

CLO4: To solve mathematical problems and use this problem-solving knowledge on various projects.

Mapping Course Learning Outcomes (CLOs) with the PLOs

Course Learning Outcomes (CLO)	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10	PLO 11	PLO 12
CLO 1	✓					✓					✓	✓
CLO 2	✓		✓			✓	✓				✓	✓
CLO 3				✓		✓						✓
CLO 4					✓	✓				✓		✓

Mapping Course Learning Outcomes (CLOs) with the Teaching-Leaning & Assessment Strategy

Course Learning Outcomes (CLO)	Teaching-Learning Strategy	Assessment Strategy
CLO 1	Lecture, Lecture note, Reference Books	Assignment, Mid Semester Examination, Class test, Final Examination
CLO 2	Lecture, Lecture note, Reference Books	Assignment, Mid Semester Examination, Class test, Final Examination

CLO 3	Lecture, Lecture note, Reference Books	Assignment, Mid Semester Examination, Class test, Final Examination
CLO 4	Lecture, Lecture note, Reference Books	Assignment, Mid Semester Examination, Class test, Final Examination

Chem 1101: Engineering Chemistry
Credits 3.00 ***Contact hours: 3.0 hrs/week***

Rationale of the Course:

Engineering Chemistry is specifically designed for students who are not pursuing a program to learn more about the physical, inorganic and organic parts. We investigate these interrelationships by studying the underlying processes in terms of their chemical, mechanical and industrial phenomena.

Course Content:

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's 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 Learning Outcomes (CLOs)

CLO1: Understand Element, Atoms & Electrons, Bohr's Model of Atom, The Aufbau Method and Electron Structures
CLO2: Analyze Chemical Changes, molarity and normality, The Periodic Table and its Physical Properties, Groups of Periodic-table
CLO3: To provide students with the skills required to succeed in graduate school, the chemical or mechanical industry.
CLO4: To expose the students to a breadth of experimental techniques using modern instrumentation.

Mapping Course Learning Outcomes (CLOs) with the PLOs

Course Learning Outcomes (CLO)	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10	PLO 11	PLO 12
CLO 1	✓				✓						✓	
CLO 2	✓						✓	✓	✓			
CLO 3		✓	✓							✓		
CLO 4	✓		✓	✓	✓	✓		✓		✓		✓

Mapping Course Learning Outcomes (CLOs) with the Teaching-Leaning & Assessment Strategy

Course Learning Outcomes (CLO)	Teaching-Learning Strategy	Assessment Strategy
CLO 1	Lecture/Book reference	Mid Semester Examination, Class Test, Assignment, Final Examination
CLO 2	Lecture/ Book reference	Mid Semester Examination, Class Test, Assignment, Final Examination

CLO 3	Lecture / Group Discussion / Book reference	Mid Semester Examination, Class Test, Assignment, Final Examination
CLO 4	Lecture / Group Discussion/ Book reference	Mid Semester Examination, Class Test, Assignment, Final Examination

Math 1101: Mathematics I

Credits 3.00 ***Contact hours: 3.0 hrs/week***

Rationale of the Course:

This course provides students with an understanding of Differential and Integral Calculus. This course gives a brief idea about Limits, Continuity, and differentiability. nth derivatives of standard functions, Leibnit'z theorem, Rolle's theorem, Mean value theorem, Expansion in finite and infinite forms, Indeterminate form, Partial differentiation, Euler's theorem, Tangent and Normal, Integration by parts, Area and Volume.

Course Content:

Differential Calculus: Limit; Continuity and differentiability; Differentiation of explicit and implicit function and parametric equations; Significance of derivatives; Differentials; Successive differentiation of various types of functions; Leibnitz's theorem; Rolle's theorem; Mean value theorems; Taylor's theorem in finite and infinite forms; Maclaurin's theorem in finite and infinite forms; Lagrange's form of remainders; Cauchy's form of remainder; Expansion of functions by differentiation and integration; Partial differentiation; Euler's theorem; Tangent and Normal; Maxima and Minima; Points of inflection and their applications; Evaluation of indeterminate forms by L' Hospitals rule.

Integral Calculus: Definition of integration. Integration by the method of substitution. Integration by parts. Standard integrals. Integration by the method of successive reduction. Definite integrals, their properties, and their use in summing series. Walli's formula. Improper integrals. Beta function and gamma function. The area under plane curves in Cartesian and polar coordinates. Area of the region enclosed by the two curves in Cartesian and polar coordinates. Trapezoidal rule and Simpson's rule. Arc lengths of curves in Cartesian and polar coordinates. Parametric and pedal equations. Intrinsic equation. The volume of solids of revolution. The volume of hollow solids of revolution by Shell method. Area of the surface of revolution. Convergence and divergence of an infinite series.

Course Learning Outcomes (CLOs)

CLO1: To understand the fundamentals of manufacturing processes and the manufacturing technology
CLO2: To know the basic courses are statics, dynamics, thermodynamics, heat transfer, systems design, and computational engineering

CLO3: To apply the knowledge in order to identify the exact mechanical operation needed for a product

Mapping Course Learning Outcomes (CLOs) with the PLOs

Course Learning Outcomes (CLO)	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10	PLO 11	PLO 12
CLO 1	✓											
CLO 2			✓									
CLO 3	✓	✓			✓			✓				✓
CLO 4			✓									

Mapping Course Learning Outcomes (CLOs) with the Teaching-Leaning & Assessment Strategy

Course Learning Outcomes (CLO)	Teaching-Learning Strategy	Assessment Strategy
CLO 1	Lecture note, Referenced Book, Whiteboard	Mid Semester Examination, Class tests, Assignments
CLO 2	Lecture note, Referenced Book, Whiteboard	Mid Semester Examination, Class tests, Assignments
CLO 3	Lecture note, Referenced Book, Whiteboard	Mid Semester Examination, Class tests, Assignments, Final Examination
CLO 4	Lecture note, Referenced Book, Whiteboard	Mid Semester Examination, Class tests, Assignments, Final Examination

Ban 1101: বাংলা ভাষা ও সাহিত্য (Bengali Language and Literature)
Credits 2.00 ***Contact hours: 2.0 hrs/week***

Rationale of the Course:
This is a high-level Bengali Language and Literature Course for all classes of student. Because as a Bengali Student it is necessary to acquire knowledge about Bengali Language and Literature. Not only that, Bengali Language and Literature occupies one of the most important places in the world. As a result, we have to have an idea about Bengali Language and Literature.

Course Learning Outcomes (CLOs)

CLO1: To develop skills in Bengali language and literature.
CLO2: To develop the ability of speech sound, letter, syllable, standard, dialectal and variation linguistic literature.
CLO3: To develop the ability of reading, writing and critique poetry.
CLO4: To develop the skills to analyze essay, novels, plays and short stories.

Mapping of CLOs with Program Learning Outcomes (PLOs)

Course Learning Outcomes (CLO)	*PLO 1*	*PLO 2*	*PLO 3*	*PLO 4*	*PLO 5*	*PLO 6*	*PLO 7*	*PLO 8*	*PLO 9*	*PLO 10*	*PLO 11*	*PLO 12*
CLO 1	√										√	
CLO 2		√			√						√	
CLO 3		√			√							
CLO 4	√	√			√							

Mapping Course Learning Outcomes (CLOs) with the Teaching-Leaning & Assessment Strategy

Course Learning Outcomes (CLO)	Teaching-Learning Strategy	Assessment Strategy
CLO 1	PPT, Lecture Notes, Reference Book, Lectures	Viva, Final Quiz
CLO 2	PPT, Lectures, Tutorials, Assignments	Assignment, Viva, Final Quiz

CLO 3	PPT, Lectures, Tutorials, Assignments	Assignment, Viva, Final Quiz
CLO 4	Lectures, Tutorials, Assignments	Class test, Viva, Final Quiz

Phy 1102: Physics I Sessional

Credits 1.50 ***Contact hours: 3.0 hrs/week***

Rationale of the Course:

This course offers an understanding of basic laboratory skills. It illustrates physics topics such as fundamental principles of electric circuit analysis, resistance in electric circuits and mechanics, illustrated by experiment. They are designed to teach specific experimental skills and techniques, e.g., experimental data collection and analysis, ethical standards in a scientific investigation through individual experiments drawn from various topics in physics.

Course Content:

Sessional based on Phy 1101

Course Learning Outcomes (CLOs)

CLO1: To link the experimental findings to underlying physics in lecture courses, textbooks and scientific journals and apply their physics knowledge and problem-solving skills to model problems in science.
CLO2: To evaluate the results of an experiment, assess the significance of the experimental results compared to expected outcomes and draw valid conclusions.
CLO3: To use and measure with standard instrumentation and handle sophisticated apparatus with confidence.
CLO4: To describe the sources of random and systematic error, calculate their effects on the results and evaluate ways of reducing the dominant error.

Mapping Course Learning Outcomes (CLOs) with the PLOs

Course Learning Outcomes (CLO)	**PLO 1**	**PLO 2**	**PLO 3**	**PLO 4**	**PLO 5**	**PLO 6**	**PLO 7**	**PLO 8**	**PLO 9**	**PLO 10**	**PLO 11**	**PLO 12**
CLO 1	✓	✓						✓			✓	✓
CLO 2	✓	✓			✓			✓			✓	
CLO 3				✓		✓				✓		✓
CLO 4	✓		✓	✓						✓		

Mapping Course Learning Outcomes (CLOs) with the Teaching-Leaning & Assessment Strategy

Course Learning Outcomes (CLO)	**Teaching-Learning Strategy**	**Assessment Strategy**
CLO 1	Lectures, Lab manual, Experimental Apparatus	Lab Performance, Lab Report, Viva, Final Quiz
CLO 2	Lectures, Lab manual, Experimental Apparatus	Lab Performance, Lab Report, Viva, Final Quiz
CLO 3	Lectures, Lab manual, Experimental Apparatus	Lab Performance, Lab Report, Viva, Final Quiz

CLO 4	Lectures, Lab manual, Experimental Apparatus	Lab Performance, Lab Report, Viva, Final Quiz

ME 1100: Mechanical Engineering Drawing I

Credits 1.50 ***Contact hours: 3.0 hrs/week***

Rationale of the Course: This course offers fundamental insights into various mechanical drawing systems. This is a basic hand drawing course Students can understand different mechanical drawings commonly forwarded in the engineering sector after the completion of this course.

Course Content: Introduction; Instruments and their uses; First and third angle projections; Orthographic drawings; Isometric views; Missing lines and views; sectional views and conventional practices; and auxiliary views.

Course Learning Outcomes (CLOs)

CLO 1: To Identify the instruments used in Foundry and welding shop.

CLO 2: To Understand the mechanism of various parts and the process they are used.

CLO 3: To Develop any prototype while analyzing its similarity with real world object.

Mapping Course Learning Outcomes (CLOs) with the PLOs

Course Learning Outcomes (CLO)	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10	PLO 11	PLO 12
CLO 1	√		√				√					√
CLO 2		√						√		√	√	
CLO 3			√	√	√	√	√	√	√	√	√	√

Mapping Course Learning Outcomes (CLOs) with the Teaching-Leaning & Assessment Strategy

Course Learning Outcomes (CLO)	Teaching-Learning Strategy	Assessment Strategy
CLO 1	PPT, Lecture Notes, Reference Book, Lectures	Viva, Final Quiz
CLO 2	PPT, Lectures, Tutorials, Assignments	Lab Submission, Viva, Final Quiz
CLO 3	PPT, Lectures, Tutorials, Assignments	Lab Submission, Viva, Final Quiz
CLO 4	Lectures, Tutorials, Assignments	Lab Submission, Viva, Final Quiz

Chem 1102: Inorganic Quantitative Analysis

Credits 1.5 ***Contact hours: 3.0 hrs/week***

Rationale of the Course:

Qualitative analysis in Chemistry gives details of the presence or nonappearance of different chemical components in an unknown sample, while quantitative analysis gives the measure of various chemical

components present in a given sample. It demonstrates various elements, or gatherings of elements like functional groups, and so forth present in the sample. Thus, a subjective investigation of any sample can be utilized to decide if a specific component is available in a sample or not.

Course Content: Volumetric analysis; Acidimetry-alkalimetry, Titrations involving redox reactions; Determination of Fe, Cu and Ca volumetrically, Complexometric titration; Determination of Ca+Mg in water.

Course Learning Outcomes (CLOs)

CLO1: To understand the core ideas in quantitative chemistry
CLO2: To identify common misconceptions and know how these can be addressed
CLO3: To explain how the core ideas of quantitative chemistry develop and progress
CLO4: To access a range of activities and resources to support students in their learning of quantitative chemistry.

Mapping Course Learning Outcomes (CLOs) with the PLOs

Course Learning Outcomes (CLO)	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10	PLO 11	PLO 12
CLO 1	✓		✓	✓								
CLO 2	✓		✓	✓				✓				✓
CLO 3	✓		✓						✓	✓		✓
CLO 4		✓		✓	✓				✓		✓	✓

Mapping Course Learning Outcomes (CLOs) with the Teaching-Leaning & Assessment Strategy

Course Learning Outcomes (CLO)	Teaching-Learning Strategy	Assessment Strategy
CLO 1	Lab procedures, Lectures, Demonstration, Lab Experiments	Lab Report, Lab Performance, Viva, Quiz
CLO 2	Lab procedures, Lectures, Demonstration, Lab Experiments	Lab Report, Lab Performance, Viva, Quiz
CLO 3	Lab procedures, Lectures, Demonstration, Lab Experiments	Lab Report, Lab Performance, Viva, Quiz
CLO 4	Lab procedures, Lectures, Demonstration, Lab Experiments	Lab Report, Lab Performance, Viva, Quiz

Shop 1100: Foundry and Welding Shops

Credits 1.0 ***Contact hours: 2.0 hrs/week***

Rationale of the Course:

This course is designed with a view to providing the students a hand-to-hand experience on foundry shop and welding shop instruments. This will help the students to forge or produce any object at the very initial stage with a good precision. This course will enhance their practical experience on usage of instruments.

Course Content:

Foundry: Introduction to foundry, tools and equipment. Patterns: function, pattern making. Molding: molding materials sand preparation, types of molds, procedure. Cores: types, core making materials. Metal melting and casting. Inspection of casting and casting defects. Welding: Metal joints: riveting, grooving, soldering, welding. Welding practice: electric arc steel, Aluminum. Types of electrodes. 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.

Course Learning Outcomes (CLOs)

CLO 1: To Identify the instruments used in Foundry and welding shop.

CLO 2: To Understand the mechanism of various parts and the process they are used.

CLO 3: To Develop any prototype while analyzing its similarity with real world object.

Mapping Course Learning Outcomes (CLOs) with the PLOs

Course Learning Outcomes (CLO)	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10	PLO 11	PLO 12
CLO 1	√		√		√		√				√	
CLO 2	√		√		√			√				√
CLO 3	√							√	√	√		√

Mapping Course Learning Outcomes (CLOs) with the Teaching-Leaning & Assessment Strategy

Course Learning Outcomes (CLO)	Teaching-Learning Strategy	Assessment Strategy
CLO 1	Lectures, Lab manual, Experimental Apparatus	Lab Report
CLO 2	Lectures, Lab manual, Experimental Apparatus	Viva, Final Quiz
CLO 3	Lectures, Lab manual, Experimental Apparatus	Viva, Final Quiz

Hum 1201: English Language

Credits 3.00 ***Contact hours: 3.0 hrs/week***

Rationale of the Course:

This course offers basic insight into the various English communication processes, which are conducted in regular practices. With the knowledge of this course, students can understand and improve the ability to communicate with proficiency, self-confidence and enhance speaking with grammatical precision in an organized fashion to communicate in various contexts of a real-life situation.

Course Content:

Introduction to Language and Writing Skills; Anatomy of Sentences; Types of Sentences; Tense, Voice, Use of Verbs, Nouns, Pronouns, and Preposition, Use of Modifiers and Connectives; Parallel Structure, Punctuation, Paragraphing, Sectioning and Summarizing; Comprehension; Essential Elements of Good Writing; Developing a Good Writing Style; Spoken Words Skills; Developing Good Speaking Style.

Course Learning Outcomes (CLOs)

CLO1: To enable the students to comprehend the spoken form

CLO2: To develop student's ability to use English in day-to-day life and real-life situation.

CLO3: To equip students with core grammar knowledge to write simple English to express ideas etc.

CLO4: To transform students capable and confident enough to use English in any given situation.

Mapping Course Learning Outcomes (CLOs) with the PLOs

Course Learning Outcomes (CLO)	PLO 10	PLO 11	PLO 12	PLO 10	PLO 11	PLO 12	PLO 10	PLO 11	PLO 12	PLO 10	PLO 11	PLO 12
CLO 1				✓		✓						
CLO 2			✓				✓	✓	✓			
CLO 3				✓								✓
CLO 4			✓	✓		✓						✓

Course Learning Outcomes (CLO)	Teaching-Learning Strategy	Assessment Strategy
CLO 1	PPT, Lecture Notes, Reference Book, audiovisual clips	Mid Semester Examination, Class Test, Final Examination
CLO 2	PPT, Lecture Notes, Reference Book, Case Study, audiovisual clips	Mid Semester Examination, Assignment, Class Test, Final Examination
CLO 3	PPT, Lecture Notes, Reference Book, Case Study, audiovisual clips	Mid Semester Examination, Assignment, Class Test, Final Examination
CLO 4	PPT, Lecture Notes, Reference Book, Case Study, audiovisual clips	Mid Semester Examination, Assignment, Class Test, Final Examination

Hum 1203: বাংলাদেশের অভ্যুদয়ের ইতিহাস (History of Bangladesh Independence)

Credits 2.00 ***Contact hours: 2.0 hrs/week***

Rationale of the Course:

Through this course students will be able to know the enact history of the rise of Bangladesh and will be able to know all the history standing from the background of independent Bangladesh in a subtle way.

Course Content:

প্রাক পাকিস্তানের ইতিহাস,পাকিস্তান পর্বে রাজনীতি, বাংলাদেশের ভৌগোলিক বৈশিষ্ট্য সমূহ ও বাঙ্গালির নৃতাত্ত্বিক ও সাংস্কৃতিক বৈশিষ্ট্য সমূহ পলাশীর যুদ্ধ ও বৃটিশ শাসন বিরোধী আন্দোলন, সিপাহী বিদ্রোহ ও বঙ্গভঙ্গ রদ, মুসলিমলীগ গঠন, পাকিস্তানের অভ্যুত্থান, ভারতরে স্বাধীনতা ঘোষনা, দ্বিজটিতত্ত্ব, লাহোর প্রস্তাব, ক্যাবিনেট মিশন, ভাষা আন্দোলন ও ১৯৬৯ এর গণ অভ্যুত্থান, ১৯৭০ এরনির্বাচন, অসহযোগ আন্দোলন, ৭মার্চের ঐতিহাসিক ভাষণ, ২৫ মার্চে ও গণহত্যা, স্বাধীনতার ঘোষনা

Course Learning Outcomes (CLOs)

CLO1: To develop the ability to gain an idea about the history of the rise of Bangladesh.
CLO2: To enhance about the skill of concept of the ethnographyphic and historical features of Bengalis and the identity of the Bengali nation.
CLO3: To develop the ability having a clean knowledge of independent Sovereign Bangladesh.
CLO4: To develop the ability to get a clean idea about the wan between Bangladesh and Pakistan period.

Mapping Course Learning Outcomes (CLOs) with PLOs

Course Learning Outcomes (CLO)	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10	PLO 11	PLO 12
CLO 1				√								
CLO 2		√										
CLO 3			√									
CLO 4						√						

Course Learning Outcomes (CLO)	Teaching-Learning Strategy	Assessment Strategy
CLO 1	PPT, Lecture Notes, Reference Book, audiovisual clips	Mid Semester Examination, Class Test
CLO 2	PPT, Lecture Notes, Reference Book, Case Study, audiovisual clips	Mid Semester Examination, Assignment, Class Test
CLO 3	PPT, Lecture Notes, Reference Book, Case Study, audiovisual clips	Assignment, Class Test, Final Examination
CLO 4	PPT, Lecture Notes, Reference Book, Case Study, audiovisual clips	Assignment, Class Test, Final Examination

EEE 1201: Electrical Engineering and Electronics Technology

Credits 4.00 ***Contact hours: 4.0 hrs/week***

Rationale of the Course: This one is a very fundamental course for the minor engineering department. This course is fully furnished with all the basic electrical machines and components we see around us in our day-to-day life. With the knowledge of this course, students can understand and improve their combined knowledge of the mechanical and electrical engineering field.

Course Content:

Electrical Circuit

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 AC 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.

Electrical Machines:

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

Electronics:

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 Learning Outcomes (CLOs)

CLO1: Understand the concepts of potential difference, current, power, and energy in electrical circuits. Solve electrical DC circuits applying network theorems.

CLO2: Understand the basics of sinusoids and phasor algebra, and solve AC circuits in the phasor domain using techniques such as nodal analysis, mesh analysis, and network theorems. Calculate RMS value, complex power, real power, reactive power, and power factor in AC circuits.

CLO3: Explain the physical operation and terminal characteristics of semiconductor diodes, BJT, JFET, and MOSFET.

CLO4: Explain the working principle and operation of the transformer and machines. Analyze problems of single-phase and three-phase transformer as well as DC and AC machines.

Mapping Course Learning Outcomes (CLOs) with the PLOs

Course Learning Outcomes (CLO)	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10	PLO 11	PLO 12
CLO 1	√	√			√	√	√			√		√
CLO 2	√	√	√	√	√	√	√		√	√	√	√

CLO 3	√	√	√	√	√			√		√	√	√
CLO 4	√		√	√	√	√	√	√	√	√	√	√

Mapping Course Learning Outcomes (CLOs) with the Teaching-Leaning & Assessment Strategy

Course Learning Outcomes (CLO)	Teaching-Learning Strategy	Assessment Strategy
CLO 1	PPT, Lecture Notes, Reference Book, Students Feedback	Mid Semester Examination, Class Test, Final Examination
CLO 2	PPT, Lecture Notes, Reference Book, Students Feedback	Mid Semester Examination, Assignment, Final Examination
CLO 3	PPT, Lecture Notes, Reference Book, Students Feedback	Mid Semester Examination, Class Test, Final Examination
CLO 4	PPT, Lecture Notes, Reference Book, Students Feedback	Mid Semester Examination, Presentation, Final Examination

Math 1201: Mathematics II

Credits 3.00 ***Contact hours: 3.0 hrs/week***

Rationale of the Course:

This course is designed to develop the topics of Co-ordinate Geometry and Differential Equations. Emphasis is placed on the development of abstract concepts and applications for first-order and linear higher-order differential equations. Upon completion, students should be able to select and use appropriate models and techniques for finding solutions to Co-ordinate Geometry and differential equations related problems.

Course Content:

Ordinary Differential Equations: Formation of differential equations. Solution of first order differential equations by various methods. Solution of general linear equations of second and higher order with constant coefficients. Solution of homogeneous linear equations. Applications. Solution of differential equations of higher order when dependent and independent variables are absent. Solution of differential equations by the method based on factorization of the operators.

Partial Differential Equations: Introduction. Differential equations of linear and nonlinear first order. Standard forms. Linear differential equations of higher order. Differential equations of second order with variable coefficients.

Co-ordinate Geometry: Transformation of co-ordinates axes and its uses; Equation of conics and its reduction to standard forms; Pair of straight lines; Homogeneous equations of second degree; Angle between a pair of straight lines; Pair of lines joining the origin to the point of intersection of two given curves; circles; System of circles; Orthogonal circles; Radical axis, radical center, properties of radical axes; Coaxial circles and limiting Department of Computer Science and Engineering points; Equations of parabola, ellipse and hyperbola in Cartesian and polar coordinates.

Course Learning Outcomes (CLOs)

CLO1: Identify and apply initial and boundary values to find particular solutions to first-order, second-order, and higher order homogeneous and non-homogeneous differential equations.
CLO2: Develop the ability to apply differential equations to significant applied and/or theoretical problems.
CLO3: System of co-ordinates. Distance between two points. Section formula. Projections, direction cosines. Equations of planes and lines.

Mapping Course Learning Outcomes (CLOs) with the PLOs

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Course Learning Outcomes (CLO)	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10	PLO 11	PLO 12
CLO 1	√				√							
CLO 2	√				√			√				√
CLO 3			√		√					√		

Mapping Course Learning Outcomes (CLOs) with the Teaching-Leaning & Assessment Strategy

Course Learning Outcomes (CLO)	Teaching-Learning Strategy	Assessment Strategy
CLO 1	Lecture Notes, White board, Reference Book	Mid Semester, Final Exam
CLO 2	Lecture Notes, White board, Reference Book	Mid Semester, Final Exam
CLO 3	Lecture Notes, White board, Reference Book	Mid Semester, Final Exam, Assignment, Class test.

CSE 1201: Computer Programming Language

Credits 3.00 ***Contact hours: 3.0 hrs/week***

Rationale of the Course: This course offers the basic introduction of computer hardware working principle, flowchart & algorithm, Fundamentals of C and C++ programming structure, its associated rules along with some compiling application software and MATLAB. Programming skill can help to build a logic to analyze the engineering numerical solution. It will build the both good skill on theoretical and software practical knowledge to the student.

Course Content: 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 Learning Outcomes (CLOs)

CLO1: To learn about the computer components and its working principle.
CLO2: To learn the fundamentals of Flowcharts & Algorithm.

CLO3: To learn and acquire the knowledge of C and C++ programming fundamentals and structures of respective programming language
CLO4: To gather the basic knowledge of applying programming logic in engineering analysis

CLO5: To learn and overview of MATLAB

Mapping Course Learning Outcomes (CLOs) with the PLOs

Course Learning Outcomes (CLO)	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10	PLO 11	PLO 12
CLO 1	√									√		√
CLO 2	√	√			√			√		√	√	√
CLO 3		√		√	√	√	√			√		
CLO 4		√	√	√			√			√		√
CLO 5	√	√								√		√

Mapping Course Learning Outcomes (CLOs) with the Teaching-Leaning & Assessment Strategy

Course Learning Outcomes (CLO)	Teaching-Learning Strategy	Assessment Strategy
CLO 1	Class lecture notes, Reference books	Class test, Assignment, Mid Semester exam
CLO 2	Class lecture notes, Reference books	Class test, Assignment, Mid Semester exam
CLO 3	Class lecture notes, Reference books	Class test, Assignment, Mid Semester exam
CLO 4	Class lecture notes, Reference books	Class test, Assignment, Presentation, Mid Semester exam, Semester Final Examination
CLO 5	Class lecture notes, Reference books	Class test, Assignment, Mid Semester exam, Semester Final Examination

EEE 1202: Electrical Engineering Sessional

Credits 0.75 ***Contact hours: 1.5 hrs/week***

Rationale of the Course:

Students will conduct some experiments with the equipment and instrument available in the laboratory, leading to the assimilation of the laws and theorems of circuit analysis. These experiments will demonstrate and prove the validity of the theories. After completing this course, students will have a better understanding of electric, magnetic, and AC circuit concepts reinforced by the practical experience of working with small scale electrical circuits.

Course Content: Laboratory experiments based on EEE 1201.

Course Learning Outcomes (CLOs)

CLO1: To apply the knowledge of basic electrical components, laws, and theorems in electrical networks practically.
CLO2: To analyze the differences between the theory and the practical observations.
CLO3: To design different circuits using circuit theorems and components.

CLO4: To demonstrate the ability of working in teams in laboratory to perform experiments.

Mapping Course Learning Outcomes (CLOs) with the PLOs

Course Learning Outcomes (CLO)	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10	PLO 11	PLO 12
CLO 1	✓		✓									
CLO 2	✓		✓					✓				✓
CLO 3	✓	✓	✓		✓				✓	✓	✓	
CLO 4				✓		✓	✓				✓	✓

Course Learning Outcomes (CLO)	Teaching-Learning Strategy	Assessment Strategy
CLO 1	Lectures, Demonstration, Lab Experiments	Lab Performance, Lab Report, Viva, Final Quiz
CLO 2	Lectures, Demonstration, Lab Experiments	Lab Performance, Lab Report, Viva, Final Quiz
CLO 3	Lectures, Demonstration, Lab Experiments	Lab Performance, Lab Report, Viva, Final Quiz
CLO 4	Lectures, Demonstration, Lab Experiments	Lab Performance, Lab Report, Viva, Final Quiz

CSE 1202: Computer Programming Language Sessional

Credits 1.5 ***Contact hours: 3.0 hrs/week***

Rationale of the Course: This course offers the basic introduction of computer hardware working principle, flowchart & algorithm, Fundamentals of C and C++ programming structure, its associated rules along with some compiling application software and MATLAB. Programming skill can help to build a logic to analyze the engineering numerical solution. It will build the both good skill on software practical knowledge to the student.

Course Content: Laboratory experiments based on CSE 1201

Course Learning Outcomes (CLOs)

CLO1: To learn about the computer components and its working principle.

CLO2: To learn the fundamentals of Flowcharts & Algorithm.

CLO3: To learn and acquire the knowledge of C and C++ programming fundamentals and structures of respective programming language

CLO4: To gather the basic knowledge of applying programming logic in engineering analysis

CLO5: To learn and overview of MATLAB

Mapping Course Learning Outcomes (CLOs) with the PLOs

Course Learning Outcomes (CLO)	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10	PLO 11	PLO 12
CLO 1	√									√		√
CLO 2	√	√			√			√		√	√	√
CLO 3		√		√	√	√	√			√		
CLO 4		√	√	√			√			√		√
CLO 5	√	√								√		√

Mapping Course Learning Outcomes (CLOs) with the Teaching-Leaning & Assessment Strategy

Course Learning Outcomes (CLO)	Teaching-Learning Strategy	Assessment Strategy
CLO 1	Lectures, Lab manual, Reference, Test in Software	Viva, Final Quiz, Lab Report
CLO 2	Lectures, Lab manual, Reference, Test in Software	Viva, Final Quiz, Lab Report
CLO 3	Lectures, Lab manual, Reference, Test in Software	Viva, Final Quiz, Lab Report
CLO 4	Lectures, Lab manual, Reference, Test in Software	Viva, Final Quiz, Lab Report
CLO 5	Lectures, Lab manual, Reference, Test in Software	Viva, Final Quiz, Lab Report

Shop 1200: Machine Shop Practices

Credits 1.0 ***Contact hours: 2.0 hrs/week***

Rationale of the Course:

This course is designed with a view to providing the students a hand-to-hand experience on machine shop instruments. This will help the students to refurbish or furnish any object at the secondary stage o the prototype. This course will enhance their practical experience on usage of instruments.

Course Content:

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 Learning Outcomes (CLOs)

CLO 1: To Identify the instruments used in Foundry and welding shop.

CLO 2: To Understand the mechanism of various parts and the process they are used.

CLO 3: To Develop any prototype while analyzing its similarity with real world object.

Mapping Course Learning Outcomes (CLOs) with the PLOs

Course Learning Outcomes (CLO)	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10	PLO 11	PLO 12
CLO 1	√		√		√		√				√	
CLO 2	√		√		√			√				√
CLO 3	√							√	√	√		√

Mapping Course Learning Outcomes (CLOs) with the Teaching-Leaning & Assessment Strategy

Course Learning Outcomes (CLO)	Teaching-Learning Strategy	Assessment Strategy
CLO 1	Lectures, Lab manual, Experimental Apparatus	Lab Report
CLO 2	Lectures, Lab manual, Experimental Apparatus	Viva, Final Quiz
CLO 3	Lectures, Lab manual, Experimental Apparatus	Viva, Final Quiz

Hum 1202: English Language Sessional
Credits: 0.75 ***Contact hours: 1.5 hrs/week***

Rationale of the Course:

This is a basic course for the mechanical engineering program. This course introduces students to the four skills of English language, reading, writing, listening and speaking. Students can gain knowledge to develop their ability and skills of English language. It also enhances skills of English language to apply in mechanical engineering applications and also for other necessities. This course is essential to improve students' English language skills.

Course Content:

Sessional based on Hum 1201.

Mapping Course Learning Outcomes (CLOs) with PLOs

CLO 1: To use the four skills of English language according to need.
CLO 2: To figure out and solve problems using English language.
CLO 3: To communicate using skills of English language.
CLO 4: To work as a team with non-native speakers.
CLO 5: To be proficient to meet up professional and social demands.

Course Learning Outcomes (CLO)	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10	PLO 11	PLO 12
CLO 1	√									√		
CLO 2		√										
CLO 3										√		
CLO 4									√			
CLO 5								√				

Mapping Course Learning Outcomes (CLOs) with the Teaching-Learning and Assessment Strategy

CLOs	Teaching-Learning Strategy	Assessment Strategy
CLO 1-CLO 5	Reference Book, PPT, WB, Handout	Assignment, Viva-Voce, Class Performance, Quizzes, Semester Final Performance

Hum 2103: Engineering Economics

Credits 2.00 ***Contact hours: 2.0 hrs/week***

Rationale of the Course:

This course will help the students understand the world they live in and will help the students make more informed life choices. As engineering students go on to participate in the economy in future, they'll need a sound understanding of the economy and how the market works which they can gain from HUM 2101 course.

Course Content:

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

Macroeconomics: Key concept of macroeconomics; saving, consumption, investment; National income analysis; Inflation, Unemployment; Fiscal and monetary policy

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

Bangladesh

Course Learning Outcomes (CLOs)

CLO1: To understand the collective and individual choice problems.

CLO2: To access the critical process of how the economy and market works.

CLO3: To apply the knowledge in making economic decisions in future.

Mapping Course Learning Outcomes (CLOs) with the PLOs

Course Learning Outcomes (CLO)	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10	PLO 11	PLO 12
CLO 1			✓	✓	✓	✓	✓		✓			✓
CLO 2	✓		✓	✓	✓			✓	✓	✓		✓
CLO 3			✓	✓	✓	✓		✓	✓			✓

Mapping Course Learning Outcomes (CLOs) with the Teaching-Leaning & Assessment Strategy

Course Learning Outcomes (CLO)	Teaching-Learning Strategy	Assessment Strategy
CLO 1	Lecture, Notes, PPT, PDF, books	Mid Semester Examination, Class Test, Assignment, Final Examination
CLO 2	Lecture, Notes, PPT, PDF, books	Mid Semester Examination, Class Test, Assignment, Final Examination
CLO 3	Lecture, Notes, PPT, PDF, books	Mid Semester Examination, Class Test, Assignment, Final Examination

Math 2101: Mathematics III

Credits 3.00 ***Contact hours: 3.0 hrs/week***

Rationale of the Course: Vector analysis and matrices have in recent years become an essential part of the mathematical background required of engineers, physicists, mathematicians and other scientists. These requirements are far from accidental, for not only does vector analysis provide a concise notation for presenting equations arising from mathematical formulations of physical and geometrical problems but these are also a natural aid in forming mental pictures of physical and geometrical ideas. In short, these might very well be considered a most rewarding language and mode of thought for the physical sciences.

Course Content:

Vector Algebra: Definition of vectors, equality of vectors. Addition and multiplication of vectors. Triple and multiple products of vectors. Application in geometry and mechanics. Linear dependence and independence of vectors.

Vector Calculus: Differentiation and integration of vectors together with elementary applications. Gradient of scalar functions. Divergence and curl of vector functions. Physical significance of gradient, divergence and curl. Line, surface and volume integrals. Stokes' theorem, Green's theorem, Gauss's divergence theorem and their applications.

Matrices: Types of matrices and algebraic properties. Rank and elementary transformations of matrices. Solution of linear equations by matrix method. Quadratic forms. Matrix polynomials. Determination of characteristic roots and vectors.

Series Solution: Convergence and divergence of an infinite series. Solution of differential equations in series by the method of Frobenius. Bessel's functions, Legendre's polynomials and their properties.

Laplace Transforms: Definition of Laplace transforms. Elementary transformation and properties. Convolution. Solution of differential equations by Laplace transforms. Evaluation of integrals by Laplace transforms.

Course Learning Outcomes (CLOs)
CLO1: Learn definitions, formulas and theorems.

CLO2: Differentiate and integrate the vector functions.

CLO3: Solve differential equations in series solution.

CLO4: Find the solution of differential equations by laplace transforms.

Mapping Course Learning Outcomes (CLOs) with the PLOs

Course Learning Outcomes (CLO)	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10	PLO 11	PLO 12
CLO 1		✓	✓		✓			✓				
CLO 2	✓				✓					✓		
CLO 3					✓			✓		✓		
CLO 4					✓			✓		✓		

Mapping Course Learning Outcomes (CLOs) with the Teaching-Leaning & Assessment Strategy

Course Learning Outcomes (CLO)	Teaching-Learning Strategy	Assessment Strategy
CLO 1	Reference books, Soft and hard copies of lecture.	Assignments, Class tests, Mid Semester and final examination.
CLO 2	Reference books, Soft and hard copies of lecture.	Assignments, Class tests, Mid Semester and final examination.
CLO 3	Reference books, Soft and hard copies of lecture.	Assignments, Class tests, Mid Semester and final examination.
CLO 4	Reference books, Soft and hard copies of lecture.	Assignments, Class tests, Mid Semester and final examination.

ME 2100: Mechanical Engineering Drawing II

Credits 1.50 ***Contact hours: 3.0 hrs/week***

Rationale of the Course:

This course offers fundamental insights into various mechanical drawing systems, mostly computer-aided design (CAD) software which is currently extensively in use in the industry. Students can understand different mechanical drawings commonly forwarded in the engineering sector after the completion of this course.

Course Content:

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 the computer.

Course Learning Outcomes (CLOs)

CLO1: To understand the fundamental concept of mechanical drawing.

CLO2: To be able to use commonly used CAD software.

CLO3: To apply the mechanical drawing concept for developing CAD drawing of various mechanical elements.

Mapping Course Learning Outcomes (CLOs) with the PLOs

Course Learning Outcomes (CLO)	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10	PLO 11	PLO 12
CLO 1					✓		✓				✓	
CLO 2					✓					✓		✓
CLO 3	✓		✓	✓	✓		✓	✓	✓			

Mapping Course Learning Outcomes (CLOs) with the Teaching-Leaning & Assessment Strategy

Course Learning Outcomes (CLO)	Teaching-Learning Strategy	Assessment Strategy
CLO 1	PPT, Lecture Notes, Reference Book, Lectures	Viva, Final Quiz
CLO 2	PPT, Lectures, Tutorials, Assignments	Lab Submission, Viva, Final Quiz
CLO 3	Lectures, Tutorials, Assignments	Lab Submission, Viva, Final Quiz

ME 2101: Engineering Mechanics I

Credits 3.00 ***Contact hours: 3.0 hrs/week***

Rationale of the Course: This course offers basic concepts of Mechanics. It develops the capacity of a student to predict the effects of force and motion while carrying out the creative design functions of engineering. This capacity requires more than a mere knowledge of the physical and mathematical principles of mechanics; also required is the ability to visualize physical configurations in terms of real materials, actual constraints, and the practical limitations which govern the behavior of machines and structures.

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

Course Learning Outcomes (CLOs)

CLO1: Learn about the principles of statics and dynamics to solve engineering problems

CLO2: Sketch the related diagrams to be used in problem solving

CLO3: Study the theory of engineering mechanics to solve related engineering problems

CLO4: Solve the Engineering problems individually or in a group based on the theoretical study.

Mapping Course Learning Outcomes (CLOs) with the PLOs

Course Learning Outcomes (CLO)	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10	PLO 11	PLO 12
CLO 1	✓				✓			✓			✓	✓
CLO 2		✓	✓		✓			✓		✓		
CLO 3	✓			✓			✓		✓			✓
CLO 4			✓			✓	✓		✓	✓		✓

Mapping Course Learning Outcomes (CLOs) with the Teaching-Learning & Assessment Strategy

Course Learning Outcomes (CLO)	Teaching-Learning Strategy	Assessment Strategy
CLO 1	Presentation Slide, Lecture Notes, Reference Book	Mid Semester Examination, Class Test, Final Examination
CLO 2	Presentation Slide, Lecture Notes, Reference Book, Oral viva	Mid Semester Examination, Assignment, Class Test, Final Examination
CLO 3	Lectures, Reference books, Supplementary video	Mid Semester Examination, Class Test, Final Examination
CLO 4	Presentation Slide, Lecture Notes, Oral viva	Mid Semester Examination, Class Test, Final Examination

ME 2103: Numerical Analysis for Engineers

Credits 3.00 ***Contact hours: 3.0 hrs/week***

Rationale of the Course:

This course will emphasize the development of numerical algorithms to provide solutions to common problems formulated in science and engineering. To Cultivate the inventiveness and creative instinct of the students in designing which method of calculation he is going to use in the data results from future experiments.

Course Content: Roots of polynomials and transcendental equations; Determinants and matrices; Eigen values and eigenvectors; 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 Learning Outcomes (CLOs)

CLO1: Develop understanding and expertise on the numerical algorithms used in engineering problems orientations.

CLO2: Use differential equations in describing and studying the behavior of certain physical

Systems.

CLO3: Implement appropriate numerical methods to solve linear equations as well as algebraic & Transcendental equations

CLO4: Ability to design and conduct experiments, as well as to analyze and interpret data.

Mapping Course Learning Outcomes (CLOs) with the PLOs

Course Learning Outcomes (CLO)	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10	PLO 11	PLO 12
CLO 1	✓		✓	✓	✓		✓	✓				
CLO 2	✓	✓								✓		
CLO 3	✓									✓		
CLO4	✓	✓	✓		✓							

Mapping Course Learning Outcomes (CLOs) with the Teaching-Leaning & Assessment Strategy

Course Learning Outcomes (CLO)	Teaching-Learning Strategy	Assessment Strategy
CLO 1	PPT, Lecture Material, Reference Book, Reference video link	Mid Semester Examination, Class Test, Final Examination
CLO 2	Lecture Notes, Reference Book, Reference video link	Mid Semester Examination, Assignment
CLO 3	Lecture Notes, Reference Book, Reference video link	Assignment, Mid Semester Examination
CLO4	PPT, Lecture Notes, Reference Book,	Class Test, Final Examination

ME 2104: Numerical Analysis Sessional

Credits 1.50 ***Contact hours: 3.0 hrs/week***

Rationale of the Course:

This course aims to develop understanding and expertise on the numerical algorithms used in engineering calculations. To understand the implications of digital number representation and digital arithmetic for computational science and engineering.

Course Content: Numerical solutions of problems related to mechanical engineering using computer-aided tool (MATLAB, Basic Programming) based on the following contents.

Roots of polynomials and transcendental equations; Determinants and matrices; Eigen values and eigenvectors; 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 Learning Outcomes (CLOs)

CLO1: Write a computer program for analysis.

CLO2: Express general functions in terms of the numerical algorithm.
CLO3: Ability to apply knowledge of numerical methods to solve engineering problems.
CLO4: Understand the fundamental principles of digital computing, as well as the number representation and arithmetic operations.

Mapping Course Learning Outcomes (CLOs) with the PLOs

Course Learning Outcomes (CLO)	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10	PLO 11	PLO 12
CLO 1	✓				✓				✓			
CLO 2		✓	✓		✓							
CLO 3	✓			✓			✓	✓		✓	✓	
CLO4		✓		✓				✓				

Mapping Course Learning Outcomes (CLOs) with the Teaching-Leaning & Assessment Strategy

Course Learning Outcomes (CLO)	Teaching-Learning Strategy	Assessment Strategy
CLO 1	C/C++/MATHLAB	Lab Report, Class Performance
CLO 2	Lecture Notes, C/C++/MATHLAB	Class Performance, Lab Report
CLO 3	Lecture, White Board, Reference Book, C/C++/MATHLAB	Lab Report, Class Performance, Final Exams
CLO4	Lecture, White Board, Reference Book, C/C++/MATHLAB	Viva -Voce, Lab Report, Final Exams

EEE 2102: Electronics Technology Sessional

Credits 0.75 ***Contact hours: 1.5 hrs/week***

Rationale of the Course:

In this course, some experiments will be conducted by the students using electronic elements like diode, transistor etc in the laboratory under the supervision of the course teacher. These experiments will help the students to relate their theoretical study with the factual work and learn about the real life applications of the electronics equipment. After completing the course, they will gather knowledge about various electronic circuits and will be able to utilize their skills for solving practical problems.

Course Content: Laboratory experiments based on EEE 1201 Electronics Technology Section.

Course Learning Outcomes (CLOs)

CLO1: Ability of doing team work by working in a team in the laboratory during the experiment.

CLO2: Ability to find the characteristics of basic electronic elements and compare them with the theoretical study.

CLO3: Ability of using the basic electronic equipment in the practical application.

CLO4: Ability to build electrical circuits using electronic elements.

CLO5: Ability of solving real life electronic circuit related problems.

Mapping Course Learning Outcomes (CLOs) with the PLOs

Course Learning Outcomes (CLO)	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10	PLO 11	PLO 12
CLO 1				✓		✓	✓					
CLO 2	✓		✓					✓			✓	✓
CLO 3	✓		✓		✓			✓	✓			
CLO 4	✓	✓			✓			✓		✓		
CLO 5		✓	✓		✓				✓		✓	✓

Mapping Course Learning Outcomes (CLOs) with the Teaching-Learning & Assessment Strategy

Course Learning Outcomes (CLO)	Teaching-Learning Strategy	Assessment Strategy
CLO 1	Lectures, Lab Experiments, Question-answer session	Lab Performance, Lab Report, Viva, Final Quiz
CLO 2	Lectures, Lab Experiments, Question-answer session	Lab Performance, Lab Report, Viva, Final Quiz
CLO 3	Lectures, Lab Experiments, Question-answer session	Lab Performance, Lab Report, Viva, Final Quiz
CLO 4	Lectures, Lab Experiments, Question-answer session	Lab Performance, Lab Report, Viva, Final Quiz

Phy 2101: Physics II

Credits 3.00 ***Contact hours: 3.0 hrs/week***

Rationale of the Course:

This course offers a details knowledge on waves and oscillations, different types of waves and important terms related to wave. It also provides the opportunity to learn the mechanism of waves with the help of various equations and the mechanism of energy transfer through waves. This course will also make the students acquainted with geometrical optics and various optical instruments.

Course Content:

Waves & Oscillations: Differential equation of a 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 oscillation, Determination of damping co-efficient, forced oscillation, Resonance, Two body oscillations, Reduced mass, Differential equation of a progressive wave, Power & intensity of wave motion, Stationary wave, Group velocity and Phase 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, Chromatic aberration; Optical instruments: Compound microscope, polarizing microscope, resolving power of a microscope, Camera and photographic techniques.

Waves Mechanics: Principles 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 equation, Schrodinger equation for one-electron atom and its solution.

Course Learning Outcomes (CLOs)

CLO1: To demonstrate an understanding of the behavior of oscillating systems and wave motion.

CLO2: To use the mathematical formalism that describes waves.

CLO3: To acquire the ability to experiment with different optical instruments.

CLO4: To use the tools, methodologies, language and conventions of physics to test and communicate ideas and explanations

Mapping Course Learning Outcomes (CLOs) with the PLOs

Course Learning Outcomes (CLO)	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10	PLO 11	PLO 12
CLO 1	✓				✓						✓	
CLO 2	✓						✓	✓				
CLO 3		✓	✓							✓		
CLO 4	✓		✓	✓	✓			✓		✓		✓

Mapping Course Learning Outcomes (CLOs) with the Teaching-Leaning & Assessment Strategy

Course Learning Outcomes (CLO)	Teaching-Learning Strategy	Assessment Strategy
CLO 1	PPT, Lecture Notes, Reference Book	Mid Semester Examination, Class Test, Assignment, Final Examination
CLO 2	PPT, Lecture Notes, Reference Book	Mid Semester Examination, Class Test, Assignment, Final Examination
CLO 3	PPT, Lecture Notes, Reference Book	Mid Semester Examination, Class Test, Assignment, Final Examination
CLO 4	PPT, Lecture Notes, Reference Book	Mid Semester Examination, Class Test, Assignment, Final Examination

Hum 2101: Environmental Protection

Credits 2.00 ***Contact hours: 2.0 hrs/week***

Rationale of the Course:

Conservation ethics, like environmental ethics, largely rely on the respect that humans either have or don't have for the environment and ecosystems. Conservation ethics also revolve around making human communities and ecosystems better, protecting important resources for the present and future.

Course Content:

Environment:

Environment and environmental issues environmental degradation, waste management and renewable energy; Basic understanding of sustainable development, SDGs, climate change adaptation; Disability and Accessibility. Environmental policies and legislation; environment protection and management

Course Learning Outcomes:

After the successful completion of the course, students will be able to:

CLO 1: Understand the engineers' relation and obligations to the environment

CLO 2: Determine the concerns for the environment and its limitations

CLO 3: Realize the moral standing of the environment

CLO 4: Keep the environmental stability while practicing

Mapping Course Learning Outcomes (CLOs) with PLOs

CLOs	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10	PLO 11	PLO 12
CLO 1		√					√	√				√
CLO 2		√						√				
CLO 3							√					
CLO 4		√				√	√					

Mapping Course Learning Outcomes (CLOs) with the Teaching-Learning and Assessment Strategy

CLOs	Teaching-Learning Strategy	Assessment Strategy
CLO 1	Lectures, Discussion with the students, Question and Answer Session, Interactive teaching, Writing reflection note on class lecture, report writing.	Class test, Assignment, Mid Semester Exam
CLO 2	Lectures, Discussion with the students, Question and Answer Session, Problems solving in the class, Interactive teaching.	Class test, Quiz test, Mid Semester Exam
CLO 3	Discussion with the students, Question and Answer Session, Problems solving in the class.	Class test, Quiz test, Final Exam
CLO 4	Lectures, Discussion with the students, Question and Answer Session, Problems solving in the class, report writing.	Class test, Assignment, Final Exam

ME 2201: Engineering Mechanics II

Credits 3.00 ***Contact hours: 3.0 hrs/week***

Rationale of the Course:

The basic concepts of force, mass, and acceleration, of work and energy, and of impulse and momentum are introduced and first applied to problems involving only particles. Thus, students can familiarize themselves with the three basic methods used in dynamics and learn their respective advantages before facing the difficulties associated with the motion of rigid bodies.

Course Content:

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

Course Learning Outcomes (CLOs)

CLO1: Remember and understand the basic kinematic and kinetics relationships between position, velocity, force, acceleration, mass, and time.
CLO2: Apply various method using these basic kinematic and kinetics relationships and calculus or graphical methods to solve problems
CLO3: Analyze the relative motion of multiple particles by using a translating coordinate system.

CLO4: Evaluate the appropriate principle to apply when solving a particle dynamics problem.

Mapping Course Learning Outcomes (CLOs) with the PLOs

(CLO)	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10	PLO 11	PLO 12
CLO 1	√		√				√					
CLO 2	√				√		√	√				
CLO 3	√							√				
CLO 4	√		√	√						√	√	

Mapping Course Learning Outcomes (CLOs) with the Teaching-Leaning & Assessment Strategy

Course Learning Outcomes (CLO)	Teaching-Learning Strategy	Assessment Strategy
CLO 1	PPT, Lecture Notes, Reference Book	Mid Semester Examination, Class Test, Assignment, Final Examination
CLO 2	PPT, Lecture Notes, Reference Book	Mid Semester Examination, Class Test, Assignment, Final Examination
CLO 3	PPT, Lecture Notes, Reference Book	Mid Semester Examination, Class Test, Assignment, Final Examination
CLO 4	PPT, Lecture Notes, Reference Book	Mid Semester Examination, Class Test, Assignment, Final Examination

ME 2203: Metallic Materials

Credits 3.00 ***Contact hours: 3.0 hrs/week***

Rationale of the Course:

This course offers basic insight into the various mechanical properties of metallic materials, which are used in various factory and industries. With the knowledge of this course, students can also learn knowledge about heat treatment of the materials and their effect.

Course Content:

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 Learning Outcomes (CLOs)

CLO1: To understand the fundamentals of properties of the materials.

CLO2: To apply the knowledge in order to select the material for manufacturing a product.

CLO3: To evaluate the proper heat treatment process for a product.

Mapping Course Learning Outcomes (CLOs) with the PLOs

Course Learning Outcomes (CLO)	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10	PLO 11	PLO 12
CLO 1	√									√	√	√
CLO 2	√		√	√	√		√	√		√		
CLO 3	√		√	√	√			√		√		

Mapping Course Learning Outcomes (CLOs) with the Teaching-Leaning & Assessment Strategy

Course Learning Outcomes (CLO)	Teaching-Learning Strategy	Assessment Strategy
CLO 1	PPT, Lecture Notes, Reference Book	Mid Semester Examination, Class Test,
CLO 2	PPT, Lecture Notes, Reference Book, Case Study	Mid Semester Examination, Assignment, Class Test, Final Examination
CLO 3	PPT, Lecture Notes, Reference Book, Case Study	Assignment, Class Test, Final Examination

ME 2205: Engineering Thermodynamics

Credits 3.00 ***Contact hours: 3.0 hrs/week***

Rationale of the Course:

It is basic of Mechanical Engineering. It is mostly important for real life practicing. Introduces amateur engineers to different branches of Mechanical Engineering.

Course Content: Fundamental concepts; Properties of gases and vapors; Laws of thermodynamics and their corollaries. Non-flow and flow processes; Ideal gases and their cycles; Power cycles, refrigeration cycles and reciprocating compressors; Second law of thermodynamics: availability, irreversibility and entropy. Thermodynamic relations and equations of state; Psychometrics.

Course Learning Outcomes (CLOs)

CLO1: to learn about fundamental concepts relevant to thermodynamics
CLO2: To learn about work and heat.
CLO3: To apply first law for a control volume and 2nd law by calculating efficiency of control volume.
CLO4: Perform energy analysis of refrigeration and heat pump thermodynamic cycles.

Mapping Course Learning Outcomes (CLOs) with the PLOs

Course Learning Outcomes (CLO)	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10	PLO 11	PLO 12
CLO 1	✓										✓	
CLO 2	✓	✓			✓		✓				✓	
CLO 3	✓		✓		✓			✓			✓	
CLO 4	✓		✓		✓			✓			✓	

Mapping Course Learning Outcomes (CLOs) with the Teaching-Leaning & Assessment Strategy

Course Learning Outcomes (CLO)	Teaching-Learning Strategy	Assessment Strategy
CLO 1	to learn about fundamental concepts relevant to thermodynamics	Oral Viva
CLO 2	To learn about work and heat.	Oral Viva
CLO 3	To apply first law for a control volume and 2nd law by calculating efficiency of control volume.	Assignment and Conceptual Test
CLO 4	Perform energy analysis of refrigeration and heat pump thermodynamic cycles.	Conceptual Test

Math 2201: Mathematics IV

Credits 3.00 ***Contact hours: 3.0 hrs/week***

Rationale of the Course:

This course is used as a unique tool of doing mathematical analysis which has vast applications in Engineering and Physics. A large number of problems of two dimensions regarding definite integral be solved easily such as contour integration. Basic of Fourier Series helps to analyze decomposition of signals, optics, image processing and vibration analysis.

Course Content:

Complex Variable: Complex number system. General functions of a complex variable. Limit and continuity of a function of complex variables and related theorems. Complex differentiation and the Cauchy-Riemann equations. Mapping by elementary functions. Line integral of a complex function. Cauchy's integral theorem. Cauchy's integral formula. Liouville's theorem, Taylor's theorem and Laurent's theorem. Singular points, residues and Cauchy's residue theorem. Evaluation of residues. Contour integration. Conformal mapping.

Fourier series: Real and complex form of Fourier series. Finite Fourier transform. Fourier integrals. Fourier transforms and their uses in solving boundary value problems.

Harmonic Functions: Definition of harmonics. Laplace's equation in Cartesian, polar, cylindrical and spherical coordinates. Solution 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.

Course Learning Outcomes (CLOs)

CLO1: To understand algebra and geometry of complex numbers, mappings in the complex plane, the theory of multi-valued functions and define a smooth arc or a smooth closed curve

CLO2: To understand the relationship between Fourier series and linear time-invariant system, and continuous-time periodic signals as well as identify system properties based on impulse response and Fourier analysis

CLO3: To be able to analyze and calculate heat equation and wave equation

Mapping Course Learning Outcomes (CLOs) with the PLOs

(CLO)	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10	PLO 11	PLO 12
CLO 1	✓			✓	✓		✓			✓		
CLO 2	✓		✓	✓	✓					✓		
CLO 3	✓		✓		✓							

Mapping Course Learning Outcomes (CLOs) with the Teaching-Leaning & Assessment Strategy

Course Learning Outcomes (CLO)	Teaching-Learning Strategy	Assessment Strategy
CLO 1	PPT, Lecture Notes, Reference Books	Mid Semester Examination, Class Assessment, Presentation, Final Examination
CLO 2	PPT, Lecture Notes, Reference Books, Case Study	Group Assignment, Presentation, Class Test, Final Examination
CLO 3	PPT, Lecture Notes, Reference Books, Online materials	Quiz Test, Assignment, Class Assessment, Final Examination

ME 2207: Mechanics of Solids

Credits 3.00 ***Contact hours: 3.0 hrs/week***

Rationale of the Course:

This course offers a complete knowledge on the deformation and motion of continuous solid media under applied external loadings such as forces, displacements and thermal changes. And to analyze the effect of such loads on column, beam and on different structures.

Course Content:

Statically indeterminate axially loaded member, axially loaded member, thermal and centrifugal stresses; Stresses in thick and-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.

Course Learning Outcomes (CLOs)

CLO1: To understand the basics of stress, strain, shear force and bending diagram on beam and load on column.
CLO2: To apply the knowledge in order to find out the stress, strain, shear force and bending on beam and load on column.
CLO3: To solve engineering problem.
CLO4: To evaluate and design proper structure

Mapping Course Learning Outcomes (CLOs) with the PLOs

Course Learning Outcomes (CLO)	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10	PLO 11	PLO 12
CLO 1	✓		✓	✓						✓		✓
CLO 2	✓		✓	✓						✓		
CLO 3	✓				✓	✓	✓	✓				
CLO 4	✓	✓					✓	✓		✓		✓

Mapping Course Learning Outcomes (CLOs) with the Teaching-Leaning & Assessment Strategy

Course Learning Outcomes (CLO)	Teaching-Learning Strategy	Assessment Strategy
CLO 1	PPT, Lecture Notes, Reference Book	Mid Semester Examination, Class Test, Final Examination
CLO 2	PPT, Lecture Notes, Reference Book, Case Study	Mid Semester Examination, Class Test, Final Examination

CLO 3	PPT, Lecture Notes, Reference Book, Case Study	Mid Semester Examination, Class Test, Final Examination
CLO 4	PPT, Lecture Notes, Reference Book, Case Study	Mid Semester Examination, Class Test, Final Examination

ME 2204: Metallic Materials Sessional

Credits 0.75 ***Contact hours: 1.5 hrs/week***

Rationale of the Course:

This course offers a practical experience to implement the theoretical knowledge gained from the course, titled as 'ME 2204: Metallic Materials'. With the help of this course, students have a hand on experience on Materials properties and heat treatment before their graduation.

Course Content:

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 Learning Outcomes (CLOs)

CLO1: To understand the mechanical properties of the materials.

CLO2: To evaluate the mechanical testing

CLO3: To determine the hardness test, impact test and collect data and compare.

Mapping Course Learning Outcomes (CLOs) with the PLOs

Course Learning Outcomes (CLO)	**PLO 1**	**PLO 2**	**PLO 3**	**PLO 4**	**PLO 5**	**PLO 6**	**PLO 7**	**PLO 8**	**PLO 9**	**PLO 10**	**PLO 11**	**PLO 12**
CLO 1	✓									✓	✓	✓
CLO 2	✓	✓	✓							✓		
CLO 3	✓	✓	✓	✓	✓			✓				

Mapping Course Learning Outcomes (CLOs) with the Teaching-Leaning & Assessment Strategy

Course Learning Outcomes (CLO)	**Teaching-Learning Strategy**	**Assessment Strategy**
CLO 1	Lectures, Lab manual, Experimental Apparatus	Viva, Final Quiz, Lab Report

CLO 2	Lectures, Lab manual, Experimental Apparatus	Viva, Lab Report
CLO 3	Lectures, Lab manual, Experimental Apparatus	Viva, Final Quiz, Lab Report

ME 2206: Engineering Thermodynamics Sessional

Credits 0.75 ***Contact hours: 1.5 hrs/week***

Rationale of the Course: This course offers a practical experience to implement the theoretical knowledge gained from the course, titled as 'ME2205: Engineering Thermodynamics. With the help of this course, students have hand on experience with Thermodynamics before their graduation.

Course Content: Laboratory experiments based on ME 2205

Course Learning Outcomes (CLOs)

CLO1: to learn about fundamental concepts relevant to thermodynamics

CLO2: To learn about work and heat.

CLO3: To apply first law for a control volume and 2nd law by calculating efficiency of control volume.

CLO4: Perform energy analysis of refrigeration and heat pump thermodynamic cycles

Mapping Course Learning Outcomes (CLOs) with the PLOs

Course Learning Outcomes (CLO)	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10	PLO 11	PLO 12
CLO 1	√										√	
CLO 2	√	√			√						√	
CLO 3	√		√		√		√	√			√	
CLO 4	√		√		√			√			√	

Mapping Course Learning Outcomes (CLOs) with the Teaching-Leaning & Assessment Strategy

Course Learning Outcomes (CLO)	Teaching-Learning Strategy	Assessment Strategy
CLO 1	Lectures, Lab manual, Experimental Apparatus	Viva, Final Quiz, Lab Report
CLO 2	Lectures, Lab manual, Experimental Apparatus	Viva, Lab Report
CLO 3	Lectures, Lab manual, Experimental Apparatus	Viva, Final Quiz, Lab Report
CLO 4	Lectures, Lab manual, Experimental Apparatus	Viva, Final Quiz, Lab Report

ME 2208: Mechanics of Solid Sessional

Credits 0.75 ***Contact hours: 1.5 hrs/week***

Rationale of the Course:

This course offers a practical experience to implement the theoretical knowledge gained from the course, titled as 'ME 2207: Mechanics of Solids'. With the help of this course, students have a hand on experience on Solid Mechanics before their graduation.

Course Content: Statically indeterminate axially loaded member, axially loaded member, thermal and centrifugal stresses; Stresses in thick and-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.

Course Learning Outcomes (CLOs)

CLO1: To understand the theoretical knowledge of stress, strain, shear force and bending moment of beam and buckling load of column.
CLO2: To apply the theoretical knowledge to evaluate the corresponding results.
CLO3: To analyze the results for proper design.

Mapping Course Learning Outcomes (CLOs) with the PLOs

Course Learning Outcomes (CLO)	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10	PLO 11	PLO 12
CLO 1	✓										✓	✓
CLO 2	✓	✓	✓	✓	✓		✓	✓			✓	
CLO 3	✓	✓			✓	✓				✓		✓

Mapping Course Learning Outcomes (CLOs) with the Teaching-Leaning & Assessment Strategy

Course Learning Outcomes (CLO)	Teaching-Learning Strategy	Assessment Strategy
CLO 1	Lectures, Lab manual, Experimental Apparatus	Viva, Final Quiz, Lab Report
CLO 2	Lectures, Lab manual, Experimental Apparatus	Viva, Final Quiz, Lab Report

CLO 3	Lectures, Lab manual, Experimental Apparatus	Viva, Final Quiz, Lab Report

Hum 2201: Sociology and Accounting

Credits 3.00 ***Contact hours: 3.0 hrs/week***

Rationale of the Course:

Sociology is a scientific study of society and intended to provide better Understanding of the great diversity of social relationships through social interactions. This course provides students with an introduction and understanding of the primary phenomena, concepts, issues and procedures such as social institutions, social class, social groups, culture, social stratification, gender ideologies, socialization process, social mobility, population problems and demography changes, globalization, etc. have been included in this course to help students have an overview of social contexts. Also, the basics of financial accounting through the accounting cycle for engineering project. The main objective of this course is to introduce the theoretical foundation of financial accounting (concepts, assumptions, and principles) and the financial statements of an enterprise. The course prepares the student to be capable of performing the different steps of the accounting cycle for engineering projects

Course Content:

Sociology:

Scope of sociology: micro and macro sociology. Some fundamental concepts. Society from savagery to civilization (table). Social evolution and techniques of production: social structure of Bangladesh. Oriental and occidental societies: feudalism. Industrial revolution: the growth of capitalism, features, social consequences. Socialism Fascism. Social control: need, means, future of social control. Leadership: types, functions, techniques, social power. Society and population: social determinants of fertility and mortality, human migration, demographic transition, density, the standard of living, population pyramid, population and world resources. Malthusian, optimum and socialistic population theory: Population problem of Bangladesh. Social pathology: crime, juvenile delinquency, slum. Nature of social change: factors of social change-biological, physical economic, cultural, technological factor. Change in production technology, means of communication, transportation, derivative social effects of converging material inventions. Effects of technology on major social institutions. Social inventions. Urbanization and industrialization in Bangladesh. Sociology of development: process of development, social planning, planning as a factor of social change, social change in Bangladesh- nature and trend. Urban ecology: city, pre-industrial and industrial, growth and nature of cities in Bangladesh. Rural sociology: features of village community in Bangladesh, social mobility, urban rural contrast. Social structure of the tribal people of Bangladesh.

Accounting:

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.22 out of 35 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 Learning Outcomes (CLOs)

CLO 1: To develop the sociological imagination to have an in-depth understanding of the society.

CLO 2: To develop knowledge about the key issues that influence the function and structure of the society, social structure and realize how it shapes and impacts social interactions and social relationships.

CLO 3: To be able to explain cultural context by the understanding us components and to identity the differences and commonalities within diverse cultures.

CLO 4: To calculate Overhead costing, process costing, product costing, marginal costing, and cost volume profit relationship, to understand long term & time-oriented decisions in project.

CLO 5: To analyze and interpret accounting information for decision purposes.

Mapping Course Learning Outcomes (CLOs) with PLOs

Course Learning Outcomes (CLO)	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10	PLO 11	PLO 12
CLO 1:	√					√						
CLO 2:	√				√							
CLO 3:		√			√							
CLO 4:		√										
CLO 5:	√					√						

ME 3101: Heat and Mass Transfer

Credits 4.00 ***Contact hours: 4.0 hrs/week***

Rationale of the Course: It is a course of basic of Mechanical Engineering. It is mostly important for heat transfer phenomena in everyday life as well as for research purpose.

Course Content:

Conduction and Radiation Heat Transfer

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

Convection, Boiling, Condensation, and Mass Transfer:

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

Heat transfer mechanism with change of phase: condensation, types, and analysis of film wise condensation on a vertical plate and horizontal cylinders; Boiling: mechanism and heat transfer correlations; Heat pipe. Heat exchanger: basic types, LMTD, exchanger effectiveness-NTU relations, fouling and scaling of heat exchanger; Heat exchanger calculations; Techniques of heat transfer augmentation; Heat exchanger devices.

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

Course Learning Outcomes (CLOs)

CLO1: Remember and understand the basic concept of heat and mass transfer and the inherent concepts.

CLO2: Apply the knowledge of heat transfer to solve real life problems.

CLO3: Create prediction about any new problem arisen for industrial production purpose or any problem related to practical life.

CLO4: Analyze the large volume problems into small discrete parts.

CLO5: Evaluate the knowledge of their subject field with other subjects.

Mapping Course Learning Outcomes (CLOs) with the PLOs

Course Learning Outcomes (CLO)	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10	PLO 11	PLO 12
CLO 1	√		√									√
CLO 2		√	√						√			
CLO 3				√	√	√				√	√	
CLO 4	√	√	√		√		√	√		√		
CLO 5	√					√						√

Mapping Course Learning Outcomes (CLOs) with the Teaching-Leaning & Assessment Strategy

Course Learning Outcomes (CLO)	Teaching-Learning Strategy	Assessment Strategy
CLO 1	To remember and understand the basic concept of heat and mass transfer and the inherent concepts.	Assignment and Exam
CLO 2	To Apply the knowledge of heat transfer to solve real life problems.	Oral Viva
CLO 3	To create prediction about any new problem arisen for industrial production purpose or any problem related to practical life.	Assignment and Conceptual Test
CLO 4	Analyze the large volume problems into small discrete parts.	Assignment and Exam
CLO 5	Evaluate the knowledge of their subject field with other subjects.	Assignment and Conceptual Test

ME 3121: Fluid Mechanics I

Credits 3.00 ***Contact hours: 3.0 hrs/week***

Rationale of the Course:

This course offers basic knowledge about various fluid properties, their measurements such as pressure, viscosity etc. and interaction of fluid with its surrounding entities which are important in practical life.

Course Content:

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 Learning Outcomes (CLOs)

CLO1: To understand fundamental definitions of fluid mechanics.
CLO2: To understand various formulae of fluid mechanics with their derivations.
CLO3: To apply the knowledge of CL01 and CLO2 in various problems.

Mapping Course Learning Outcomes (CLOs) with the PLOs

Course Learning Outcomes (CLO)	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10	PLO 11	PLO 12
CLO 1	√				√							
CLO 2	√				√			√				√
CLO 3			√		√					√		

Mapping Course Learning Outcomes (CLOs) with the Teaching-Leaning & Assessment Strategy

Course Learning Outcomes (CLO)	Teaching-Learning Strategy	Assessment Strategy
CLO 1	Lecture Notes, White board, Reference Book	Mid Semester, Final Exam
CLO 2	Lecture Notes, White board, Reference Book	Mid Semester, Final Exam
CLO 3	Lecture Notes, White board, Reference Book	Mid Semester, Final Exam, Assignment, Class test.

ME 3141: Mechanics of Machinery

Credits 3.00 ***Contact hours: 3.0 hrs/week***

Rationale of the Course:

This course offers basic insight into the mechanism of machinery as how a machine works under different conditions. With the knowledge of this course, students can identify the conditions and problems associated with a machine and how to solve it.

Course Content:

Mechanisms; displacement, velocity and acceleration; Turning moment: inertia and kinetic energy of reciprocating and rotating parts; Static and dynamic balancing: reciprocating and rotating parts, multi-cylinder in-line and V-engines, radial engines, and opposed-piston engines; Balancing machines. Undamped free vibrations with one and two degrees of freedom; Longitudinal, transverse and torsional vibrations; Damped free and forced vibrations with single degrees of freedom.

Whirling of shafts and rotors; Vibration of geared systems; Vibration absorption, isolation and desolation; Vibration measuring instruments. Study of cams and cam followers; Power transmission by belts, ropes and chains; Clutches and brakes; Dynamometers. Study of gears and gear trains; Study of governors; Gyroscopes: principles and applications.

Course Learning Outcomes (CLOs)
CLO1: To understand the fundamental mechanisms of machinery.
CLO2: To apply the knowledge in order to identify the problems associated with it.
CLO3: To evaluate the proper solving of the problems and examining the solution with the available data.

Mapping Course Learning Outcomes (CLOs) with the PLOs

Course Learning Outcomes (CLO)	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10	PLO 11	PLO 12
CLO 1	✓									✓	✓	✓
CLO 2	✓		✓	✓	✓			✓		✓		
CLO 3	✓		✓	✓	✓			✓		✓		

Mapping Course Learning Outcomes (CLOs) with the Teaching-Leaning & Assessment Strategy

Course Learning Outcomes (CLO)	Teaching-Learning Strategy	Assessment Strategy
CLO 1	PPT, Lecture Notes, Reference Book.	Mid Semester Examination, Class Test, Final Examination
CLO 2	PPT, Lecture Notes, Reference Book, Case Study.	Mid Semester Examination, Assignment, Class Test, Final Examination
CLO 3	PPT, Lecture Notes, Reference Book, Case Study	Mid Semester Examination, Assignment, Class Test, Final Examination

ME 3143: Instrumentation and Measurement

Credits 3.00 ***Contact hours: 3.0 hrs/week***

Rationale of the Course: The course focuses on imparting the principles of measurement which includes the working mechanism of various sensors and devices that are in use to measure the important physical variables of various mechatronic systems. It required to select appropriate device for the measurement of parameters like temperature, pressure, speed, stress, humidity, flow velocity etc., and justify its use through characteristics and performance

Course Content: Basic principles of measurements; Characterization and behavior of typical measuring systems; Uncertainty analysis; Different types of sensing elements; Signal Conditioning. Applied Measurements: displacements, motion, vibration, sound, pressure, flow, temperature, heat flux, force, torque and strain; Data acquisition, transmission and recording methods.

Course Learning Outcomes (CLOs)
CLO1: Understand the methods of measurement and selection of measuring instruments, standards of measurement
CLO2: Explain tolerance, limits of size, fits, geometric and position tolerances and gauge design
CLO3: Analyze the Data collected. Recommend the Quality Control Techniques and Statistical Tools appropriately
CLO4: Develop an ability of problem solving and decision making by identifying and analyzing the cause for variation and recommend suitable corrective actions for quality improvement

Mapping Course Learning Outcomes (CLOs) with the PLOs

Course Learning Outcomes (CLO)	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10	PLO 11	PLO 12
CLO 1	✓						✓				✓	
CLO 2		✓	✓		✓		✓					
CLO 3			✓	✓					✓	✓		
CLO 4				✓		✓				✓		✓

Mapping Course Learning Outcomes (CLOs) with the Teaching-Leaning & Assessment Strategy

Course Learning Outcomes (CLO)	Teaching-Learning Strategy	Assessment Strategy
CLO 1	Presentation Slide, Lecture Notes, Reference Book	Mid Semester Examination, Class Test, Final Examination
CLO 2	Presentation Slide, Lecture Notes, Reference Book, Oral viva	Mid Semester Examination, Assignment, Class Test, Final Examination
CLO 3	Lectures, Reference books, Supplementary video	Mid Semester Examination, Class Test, Final Examination
CLO 4	Presentation Slide, Lecture Notes, Oral viva	Mid Semester Examination, Class Test, Final Examination

Hum 3161: Engineering Ethics and Professionalism

Credits 2.00 ***Contact hours: 2.0 hrs/week***

Rationale of the Course:

This course will familiarize students with the content and the processes within ethical decision-making concerning the natural and social environment. This course will introduce students to the main ethical theories pertaining to the environment and include introduction to anthropocentric, bio-centric and eco-centric viewpoints. The course considers the impacts of ethical considerations on a range of real-world environmental situations including ethics in stakeholder consultation, working with Indigenous peoples and ethics within environmental management. The course will provide case studies to assist build student understanding of how world views and ethical considerations influence and shape decision making and develop environmental management.

Course Content: Society: emergence of Sociology as moral lessons for society; Basic institutions in society, organization and institutions in society, Types of Society; Culture: basics of culture, elements of culture, cultural change, socialization, and social issues around us; Technology and society: interaction between technology and society;

Engineering ethics: understanding ethics, engineering ethics; Moral reasoning and engineering as social experimentation; The engineers' concern for safety, professional responsibility; Employer authority; Rights of engineers; Global issues; Career choice and professional outlook; Ethical problems are like design problems; Genetically modified objects (GMO); Environment: environment and environmental issues environmental degradation, waste management and renewable energy; Basic understanding of sustainable development, SDGs, climate change adaptation; Disability and Accessibility.

Course Learning Outcomes (CLOs)

CLO1: Knowledge and understanding of the content and techniques of a chosen discipline at advanced levels that are internationally recognized.
CLO2: Evaluate and synthesize information from a wide variety of sources in a planned and timely manner.
CLO3: Apply ethical system for any particular professional problem domain.
CLO4: Analyze the kills of a high order in interpersonal understanding, teamwork and communication.
CLO5: Create commitment to the highest standards of professionalism.

Mapping of CLOs with Program Learning Outcomes (PLOs)

CLOs	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10	PLO 11	PLO 12
CLO 1									√			√
CLO 2												
CLO 3						√						√
CLO 4				√			√					
CLO 5				√		√						

Mapping Course Learning Outcomes (CLOs) with the Teaching-Leaning & Assessment Strategy

Course Learning Outcomes (CLO)	Teaching-Learning Strategy	Assessment Strategy
CLO 1	Presentation Slide, Lecture Notes, Reference Book	Mid Semester Examination, Class Test

CLO 2	Presentation Slide, Lecture Notes, Reference Book, Oral viva	Mid Semester Examination, Assignment, Class Test
CLO 3	Lectures, Reference books, Supplementary video	Class Test, Final Examination
CLO 4	Presentation Slide, Lecture Notes, Oral viva	Class Test, Final Examination
CLO 5	Presentation Slide, Lecture Notes, Oral viva	Class Test, Assignment, Final Examination

ME 3142: Heat and Mass Transfer Sessional

Credits 1.50 ***Contact hours: 3.0 hrs/week***

Rationale of the Course:

This course offers a practical experience to implement the theoretical knowledge gained from the course, titled as "ME 3101: Heat and Mass Transfer". With the help of this course, students can develop understanding and demonstrate the basic principles of Heat and Mass Transfer like, the phenomenon of heat conduction, convection and heat exchange and to enhance the psychomotor skills.

Course Content: Sessional based on ME 3101. The contents are given below.

Conduction and Radiation Heat Transfer

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

Convection, Boiling, Condensation, and Mass Transfer

Mechanism of convective heat transfer; General methods for estimation of convective heat transfer coefficient; Heat and momentum transfer associated with laminar and turbulent flow of fluids in forced convection; Fully developed flows and boundary layer developments in tubes/ducts over flat plates: empirical equations; Free convection from exterior surfaces of common geometrics, such as cylinder, plate, sphere etc. Heat transfer mechanism with change of phase: condensation, types and analysis of film wise condensation on a vertical plate and horizontal cylinders; Boiling: mechanism and heat transfer correlations; Heat pipe. Heat exchanger: basic types, LMTD, exchanger effectiveness-NTU relations, fouling and scaling of heat exchanger; Heat exchanger calculations; Techniques of heat transfer augmentation; Heat exchanger devices. Mass Transfer: mechanism of mass transfer by diffusion convection and change of phase, simultaneous heat and mass transfer phenomena; Analogy between heat and mass transfer; Empirical equations.

Course Learning Outcomes (CLOs)

CLO1: To understand different loads acting on machines.
CLO2: To be able to balance all forces acting on shafts.
CLO3: To learn about vibration system, followers and governors.
CLO4: To be able to identify damped, undamped vibrations and degrees of freedom.

Mapping Course Learning Outcomes (CLOs) with the PLOs

Course Learning Outcomes (CLO)	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10	PLO 11	PLO 12
CLO 1	√	√	√		√			√		√	√	√
CLO 2	√	√	√		√			√			√	
CLO 3	√	√	√		√			√		√	√	√
CLO 4	√	√	√	√	√	√	√	√	√	√	√	
CLO 5	√		√		√		√		√	√	√	√

Mapping Course Learning Outcomes (CLOs) with the Teaching-Leaning & Assessment Strategy

Course Learning Outcomes (CLO)	Teaching-Learning Strategy	Assessment Strategy
CLO 1	Lectures, Lab manual, Experimental Apparatus	Viva, Final Quiz, Lab Report
CLO 2	Lectures, Lab manual, Experimental Apparatus	Viva, Final Quiz, Lab Report
CLO 3	Lectures, Lab manual, Experimental Apparatus	Viva, Final Quiz, Lab Report
CLO 4	Lectures, Lab manual, Experimental Apparatus	Viva, Final Quiz, Lab Report
CLO 5	Lectures, Lab manual, Experimental Apparatus	Viva, Final Quiz, Lab Report

ME 3122: Fluid Mechanics I Sessional

Credits 1.0 ***Contact hours: 2.0 hrs/week***

Rationale of the Course:

Experimental knowledge about different instruments of fluid mechanics helps students to understand theories clearly.

Course Content: Sessional on ME 3121, Course content of ME 3121 is given below

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 Learning Outcomes (CLOs)

CLO1: To learn name of different instruments
CLO2: To learn how to use these instruments
CLO3: To learn how to take readings and use these data for calculation

Mapping Course Learning Outcomes (CLOs) with the PLOs

Course Learning Outcomes (CLO)	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10	PLO 11	PLO 12
CLO 1	√				√							
CLO 2	√				√			√				√
CLO 3			√		√					√		

Mapping Course Learning Outcomes (CLOs) with the Teaching-Leaning & Assessment Strategy

Course Learning Outcomes (CLO)	Teaching-Learning Strategy	Assessment Strategy
CLO 1	Demonstrating instruments and White board	Sessional Final, Lab report
CLO 2	Demonstrating instruments and White board	Sessional Final, Lab report
CLO 3	Demonstrating instruments and White board	Sessional Final, Lab report and Lab performance

ME 3141: Mechanics of Machinery Sessional

Credits 1.50 ***Contact hours: 3.0 hrs/week***

Rationale of the Course: This course offers a practical experience to implement the theoretical knowledge gained from the course, titled as 'ME 3141, Mechanics of Machinery Sessional'. With the help of this course, students will be able to visualize different mechanics involved in machinery.

Course Content: Sessional based on ME 3141. The content of ME 3141 is given below:

Mechanisms; displacement, velocity and acceleration; Turning moment: inertia and kinetic energy of reciprocating and rotating parts; Static and dynamic balancing: reciprocating and rotating parts, multicylinder in-line and V-engines, radial engines, and opposed-piston engines; Balancing machines. Undamped free vibrations with one and two degrees of freedom; Longitudinal, transverse and torsional vibrations; Damped free and forced vibrations with single degrees of freedom.

Whirling of shafts and rotors; Vibration of geared systems; Vibration absorption, isolation and desolation; Vibration measuring instruments. Study of cams and cam followers; Power transmission by belts, ropes and chains; Clutches and brakes; Dynamometers. Study of gears and gear trains; Study of governors; Gyroscopes: principles and applications.

Course Learning Outcomes (CLOs)

CLO1: To understand the fundamental mechanisms of machinery.
CLO2: To apply the knowledge in order to identify the problems associated with it.
CLO3: To evaluate the proper solving of the problems and examining the solution with the available data.

Mapping Course Learning Outcomes (CLOs) with the PLOs

Course Learning Outcomes (CLO)	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10	PLO 11	PLO 12
CLO 1	✓						✓				✓	
CLO 2	✓	✓	✓	✓	✓			✓	✓	✓	✓	
CLO 3		✓				✓	✓					✓
CLO 4	✓			✓	✓		✓		✓			✓

Mapping Course Learning Outcomes (CLOs) with the Teaching-Leaning & Assessment Strategy

Course Learning Outcomes (CLO)	Teaching-Learning Strategy	Assessment Strategy
CLO 1	Lectures, Lab manual, Experimental Apparatus	Viva, Final Quiz, Lab Report
CLO 2	Lectures, Lab manual, Experimental Apparatus	Viva, Final Quiz, Lab Report
CLO 3	Lectures, Lab manual, Experimental Apparatus	Viva, Final Quiz, Lab Report
CLO 4	Lectures, Lab manual, Experimental Apparatus	Viva, Final Quiz, Lab Report

ME 3144: Instrumentation and Measurement Sessional

Credits 1.50 ***Contact hours: 3.0 hrs/week***

Rationale of the Course:

This course offers a practical experience to implement the theoretical knowledge gained from the course, titled as 'ME3143: Instrumentation and Measurement'. With the help of this course, students have hand on experience with different types of instruments before their graduation.

Course Content:

Basic principles of measurements; Characterization and behavior of typical measuring systems; Uncertainty analysis; Different types of sensing elements; Signal Conditioning. Applied Measurements: displacements, motion, vibration, sound, pressure, flow, temperature, heat flux, force, torque and strain; Data acquisition, transmission and recording methods.

Course Learning Outcomes (CLOs)

CLO1: To understand different types of measurement systems used in engineering systems.
CLO2: To apply the theoretical knowledge for measuring different types of instruments.
CLO3: To analyze the performance data and evaluate the best procedure.

Mapping Course Learning Outcomes (CLOs) with the PLOs

Course Learning Outcomes (CLO)	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10	PLO 11	PLO 12
CLO 1			√		√			√				
CLO 2	√				√		√	√				
CLO 3	√		√					√				

Mapping Course Learning Outcomes (CLOs) with the Teaching-Leaning & Assessment Strategy

Course Learning Outcomes (CLO)	Teaching-Learning Strategy	Assessment Strategy
CLO 1	Lectures, Lab manual, Experimental Apparatus	Viva, Final Quiz, Lab Report.
CLO 2	Lectures, Lab manual, Experimental Apparatus	Viva, Final Quiz, Lab Report.
CLO 3	Lectures, Lab manual, Experimental Apparatus	Viva, Final Quiz, Lab Report.

ME 3203: Power Plant Engineering
Credits 3.00 ***Contact hours: 3.0 hrs/week***

Rationale of the Course:

This course offers basic insight of the Power Condition of Bangladesh and various Power plant e.g. Diesel Power Plant, Gas Turbine Power Plant etc., students can identify the power demand of Bangladesh and identify the Suitable power plant.

Course Content:

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: cycle analysis; intercooling, regeneration, and reheating, governing; Thermal power plants: fuels, combustion equipment; Boilers; Steam turbines: reheat, regenerative, superposed, binary and combined cycles. Condensers, evaporators and cooling towers, gas loop and water loop, steam piping and insulations. Hydro-electric power plants: site selection, components of the plant; Governing of water turbines; Nuclear power plant: types of reactors, layout of nuclear power plant, waste disposal.

Course Learning Outcomes (CLOs)

CLO1: To understand the fundamentals of Power demand and calculations, Operation cycle and procedure of different Power Plants.

CLO2: Apply the knowledge in order to identify the suitable Power Plant for any local area.

CLO3: To evaluate the proper Powerplant based on demand and fuel availability conditions.

Mapping Course Learning Outcomes (CLOs) with the PLOs

Course Learning Outcomes (CLO)	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10	PLO 11	PLO 12
CLO 1	✓		✓	✓	✓		✓	✓		✓	✓	✓
CLO 2		✓	✓	✓	✓			✓		✓		
CLO 3			✓	✓		✓		✓	✓		✓	

Mapping Course Learning Outcomes (CLOs) with the Teaching-Leaning & Assessment Strategy

Course Learning Outcomes (CLO)	Teaching-Learning Strategy	Assessment Strategy
CLO 1	PPT, Lecture Notes, Reference Book	Mid Semester Examination, Class Test, Final Examination
CLO 2	PPT, Lecture Notes, Reference Book, Case Study	Mid Semester Examination, Assignment, Class Test, Final Examination
CLO 3	PPT, Lecture Notes, Reference Book, Case Study	Mid Semester Examination, Assignment, Class Test, Final Examination

ME 3223: Fluid Mechanics II
Credits 3.00 ***Contact hours: 3.0 hrs/week***

Rationale of the Course: This course offers basic knowledge about properties of real fluids, various kind of fluid flow and their practical implementation, concept of boundary layer etc. and interaction of fluid with its surrounding entities which can be applied in solving practical life problems.

Course Content: Dimensional analysis and similitude; Fundamental relations of compressible flow; Speed of sound wave; Stagnation states for the flow of an ideal gas; Flow through converging-diverging nozzles; Normal shock; Real fluid flow; Frictional losses in pipes and fittings. Introduction to boundary layer theory; Estimation of boundary layer and momentum thickness; Skin friction and drag of a flat plate. Introduction to open channel flow; best hydraulic channel cross-sections; Hydraulic jump; Specific energy; Critical depth.

Course Learning Outcomes (CLOs)

CLO1: To understand the basics properties of real fluids and fluid flows.
CLO2: To learn about the practical implementation of CLO1
CLO3: To have a concrete understanding of dimensional analysis and boundary layer theorem.
CLO4: To learn about open channel flow, best hydraulic channel cross-sections, hydraulic jump; Specific energy and critical depth.

Mapping Course Learning Outcomes (CLOs) with the PLOs

Course Learning Outcomes (CLO)	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10	PLO 11	PLO 12
CLO 1	✓			✓			✓		✓		✓	✓
CLO 2		✓	✓		✓	✓		✓	✓	✓	✓	✓
CLO 3	✓			✓						✓		
CLO 4	✓	✓	✓		✓		✓	✓			✓	✓

Mapping Course Learning Outcomes (CLOs) with the Teaching-Leaning & Assessment Strategy

Course Learning Outcomes (CLO)	Teaching-Learning Strategy	Assessment Strategy
CLO 1	Presentation Slide, Lecture Notes, Reference Book	Mid Semester Examination, Class Test, Final Examination
CLO 2	Presentation Slide, Lecture Notes, Reference Book, Oral viva	Mid Semester Examination, Assignment, Class Test, Final Examination
CLO 3	Lectures, Reference books, Supplementary video	Mid Semester Examination, Class Test, Final Examination
CLO 4	Presentation Slide, Lecture Notes, Oral viva	Mid Semester Examination, Class Test, Final Examination

ME 3243: Machine Design
Credits 4.00 ***Contact hours: 4.0 hrs/week***

Rationale of the Course:

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

Course Content:

Introduction to design; Simple Stress analyses; Pressure vessels; Stresses in curved members; Deflection and stiffness considerations; Column design; Design for static strength; Design for fatigue strength; Design of permanent and non-permanent joints.

Mechanical springs; Rolling contact bearings; Journal bearings; Spur, helical, gears; Rope and Belt drives.

Course Learning Outcomes (CLOs)

CLO 1: To develop skills in the art of machine component design through design assignments.

CLO 2: To develop the ability to perform design analysis with sufficient depth to enable innovation.

CLO 3: To improve the ability to design creatively for quality products for a sustainable environment.

CLO 4: To enhance team skills through assembly design for methodical machine parts.

Mapping of CLOs with Program Learning Outcomes (PLOs)

Course Learning Outcomes (CLO)	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10	PLO 11	PLO 12
CLO 1	✓											
CLO 2		✓										
CLO 3	✓				✓							
CLO 4									✓			✓

Mapping Course Learning Outcomes (CLOs) with the Teaching-Leaning & Assessment Strategy

Course Learning Outcomes (CLO)	Teaching-Learning Strategy	Assessment Strategy
CLO 1	Lecture Notes, Class room Teaching, Online Video Lecture	Mid Semester Exam, Class Test, Semester Final Exam
CLO 2	Lecture Notes, Class room Teaching, Online Video Lecture	PPT Presentation, Assignment, Class Test, Semester Final Exam
CLO 3	Lecture Notes, Class room Teaching, Online Video Lecture	Mid Semester Exam, Assignment, Class Test, Semester Final Exam
CLO 4	Online Resources, Class room Mentoring, Group Discussion	PPT Presentation, Group Assignment,

IPE 3231: Manufacturing Processes
Credits 3.00 ***Contact hours: 3.0 hrs/week***

Rationale of the Course:

Introduce students to theory and operation of manufacturing including manufacturing processes and equipment overview, manufacturing design, production process and flow, materials, machine operations and logistics.

Course Contents:

Selection of machining. Casting: sand, die, centrifugal and other types of casting; Casting design and casting defects; Chip less metal forming process; Different types of hot and cold working processes; Welding: arc, gas, TIG, MIG, resistance, thermite, and special types; Brazing and soldering. Tool geometry and chip formation processes. Metal removing processes: turning, drilling, shaping, planning, milling, broaching, grinding, precision and non-precision finishing processes.

Course Learning Outcomes (CLOs)

CLO 1: Identify the different stages of a manufacturing process.
CLO 2: Interpret the elements of the product design process.
CLO 3: Identify the common machines used in a manufacturing process.
CLO 4: Explain the operations and capabilities of machines used in manufacturing.
CLO 5: Determine the operations used in finishing manufactured products.

Mapping Course Learning Outcomes (CLOs) with PLOs

Course Learning Outcomes (CLO)	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10	PLO 11	PLO 12
CLO 1	√											

CLO 2						√	√					
CLO 3	√	√										
CLO 4		√				√						
CLO 5							√					

IPE 3201: Industrial Management
Credits 3.00 ***Contact hours: 3.0 hrs/week***

Rationale of the Course: Industrial management is a branch of engineering which facilitates creation of management system and integrates the diverse engineering processes. Industrial Management deals with industrial design, construction, management, and application of science and engineering principles to improve the entire industrial infrastructure and industrial processes. Industrial Management focuses on the management of industrial processes. Industrial Managers can be said to be responsible for proper and the most efficient interaction of 4Ms: Man, Material, Machine and Method. Industrial management also involves studying the performance of machines as well as people. Specialists are employed to keep machines in good working condition and to ensure the quality of their production. The flow of materials through the plant is supervised to ensure that neither workers nor machines are idle. Constant inspection is made to keep output up to standard.

Course Content:

Organization and management: evolution, management functions, organization structure, development of organization theory, study of various types of organization and management information systems, concepts and scope of application. 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.

Personnel management: importance, scope, need hierarchy, motivation, defense mechanism, productivity and satisfaction, leadership, group dynamics, job evaluation and merit rating personnel development-hiring, training, wage systems.

Marketing management: marketing concept, marketing organization, industrial and consumer selling, channel decisions, advertising decisions, new product strategy. Technology management. Case study.

Course Learning Outcomes (CLOs)

CLO1: Understand the types of different organizations.

CLO2: Understand the basics of concepts of organization span and personnel management and managerial grid.

CLO3: Explain the framework of recruitment and principles of good interview.

CLO4: Explain the functions of leader and the model of motivation.

Mapping Course Learning Outcomes (CLOs) with the PLOs

Course Learning Outcomes (CLO)	**PLO 1**	**PLO 2**	**PLO 3**	**PLO 4**	**PLO 5**	**PLO 6**	**PLO 7**	**PLO 8**	**PLO 9**	**PLO 10**	**PLO 11**	**PLO 12**

CLO 1	✓	✓			✓	✓	✓			✓		✓
CLO 2	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓
CLO 3	✓	✓	✓	✓	✓			✓		✓	✓	✓
CLO 4	✓		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

Mapping Course Learning Outcomes (CLOs) with the Teaching-Leaning & Assessment Strategy

Course Learning Outcomes (CLO)	Teaching-Learning Strategy	Assessment Strategy
CLO 1	PPT, Lecture Notes, Reference Book, Students Feedback	Mid Semester Examination, Class Test, Final Examination
CLO 2	PPT, Lecture Notes, Reference Book, Students Feedback	Mid Semester Examination, Assignment, Final Examination
CLO 3	PPT, Lecture Notes, Reference Book, Students Feedback	Mid Semester Examination, Class Test, Final Examination
CLO 4	PPT, Lecture Notes, Reference Book, Students Feedback	Mid Semester Examination, Presentation, Final Examination

ME 3224: Fluid Mechanics II Sessional
Credits 1.0 ***Contact hours: 2.0 hrs/week***

Rationale of the Course:

This course offers a practical experience to implement the theoretical knowledge gained from the course, titled as 'ME3223, Fluid Mechanics II'. With the help of this course, students have a hand on experience on Fluid Mechanics before their graduation.

Course Content: Sessional based on ME 3223. The content of ME3223 is given below.

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 Learning Outcomes (CLOs)

CLO1: To understand the working principle of Fluid mechanic through practical experience
CLO2: To apply the theoretical knowledge for calculating the performance of fluid mechanic.
CLO3: To analyze the performance data and evaluate the best procedure.
CLO4: To enhance team skill through group project.

Mapping Course Learning Outcomes (CLOs) with the PLOs

Course Learning Outcomes (CLO)	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10	PLO 11	PLO 12
CLO 1	√		√				√					

CLO 2	√				√		√	√				
CLO 3	√							√				
CLO 4	√		√	√						√	√	

Mapping Course Learning Outcomes (CLOs) with the Teaching-Leaning & Assessment Strategy

Course Learning Outcomes (CLO)	Teaching-Learning Strategy	Assessment Strategy
CLO 1	Lectures, Lab manual, Experimental Apparatus	Viva, Final Quiz, Lab Report
CLO 2	Lectures, Lab manual, Experimental Apparatus	Viva, Final Quiz, Lab Report
CLO 3	Lectures, Lab manual, Experimental Apparatus	Viva, Final Quiz, Lab Report
CLO 4	Lectures, Lab manual, Experimental Apparatus	Viva, Final Quiz, Lab Report

ME 3244: Machine Design Sessional
Credits 1.50 ***Contact hours: 3.0 hrs/week***

Rationale of the Course:

This course offers a practical experience to implement the theoretical knowledge gained from the course, titled as 'ME 3244, Machine Design. With the help of this course, students have a hand on experience on different machines and their designs.

Course Content:

Sessional based on ME 3244.

Course Learning Outcomes (CLOs):

CLO 1: Determine the stress, strain and deflection of simple machine elements.

CLO 2: Estimate safety factors of simple structures exposed to static and repeated loads

CLO 3: Determine performance requirements in the selection of commercially available machine elements

Mapping Course Learning Outcomes (CLOs) with the PLOs

Course Learning Outcomes (CLO)	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10	PLO 11	PLO 12
CLO 1	√		√									√
CLO 2												
CLO 3	√		√				√					√

IPE 3232: Manufacturing Process Sessional
Credits 1.0 ***Contact hours: 2.0 hrs/week***
Rationale of the Course:

This course offers a practical experience to implement the theoretical knowledge gained from the course, titled as 'IPE 3231, Manufacturing Processes'. With the help of this course, students have a hand on experience on different Manufacturing Processes.

Course Content: Sessional based on IPE 3231. The content of IPE 3231 is given below.

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

Tool geometry and chip formation processes. Metal removing processes: turning, drilling, shaping, planning, milling, broaching, grinding, precision and non-precision finishing processes.

Course Learning Outcomes (CLOs)

CLO1: To study different machining processes
CLO2: To get in hand experience of different machining processes
CLO3: To learn about casting process

CLO4: To be able to identify defects in manufactured products and find out the reason for that

Mapping Course Learning Outcomes (CLOs) with the PLOs

Course Learning Outcomes (CLO)	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10	PLO 11	PLO 12
CLO 1	√	√	√	√	√		√	√			√	√
CLO 2			√	√		√	√	√	√	√	√	
CLO 3	√	√	√	√	√		√	√			√	√
CLO 4	√				√	√	√	√	√		√	√

Mapping Course Learning Outcomes (CLOs) with the Teaching-Leaning & Assessment Strategy

Course Learning Outcomes (CLO)	Teaching-Learning Strategy	Assessment Strategy
CLO 1	Lectures, Lab manual, Experimental Apparatus	Viva, Final Quiz, Lab Report
CLO 2	Lectures, Lab manual, Experimental Apparatus	Viva, Final Quiz, Lab Report
CLO 3	Lectures, Lab manual, Experimental Apparatus	Viva, Final Quiz, Lab Report
CLO 4	Lectures, Lab manual, Experimental Apparatus	Viva, Final Quiz, Lab Report

ME 4101: Internal Combustion Engine
Credits 3.00 ***Contact hours: 3.0 hrs/week***
Rationale of the Course: This course offers a theoretical understanding of combustion in engines, pollution from fuel combustion, and pollution control mechanisms. By acquiring the fundamentals of performance parameters, the students can understand the aspects of engine design.

Course Content: Introduction: basic engine types, operation, and testing; Idealized cycles and processes; IC engine fuels: Stoichiometry, properties, and tests; Combustion: SI engine, CI engine and gas turbines; Exhaust gas analysis and air pollution: pollution formation mechanism, measurement, and control; Fuel metering: SI engines, CI engines; Air capacity of engines: two and four-stroke cycles, naturally aspirated and supercharged; IC engine cooling and lubrication systems; Performance and design: Naturally aspirated engines and supercharged engines, design considerations, application of the principle of similitude in engine design. Compressors and turbines: compression processes, volumetric efficiency, multistage compression, intercooling; various types of compressors and gas turbines.

Course Learning Outcomes (CLOs)

CLO1: To understand the basics of the combustion process, stoichiometry, and engine performance parameters, engine cycles, cooling, and lubrication system, supercharging,
CLO2: To learn about pollution, control mechanisms, and international standards and guidelines.
CLO3: To have a concrete understanding of engine performance tests, performance-enhancing techniques.

CLO4: To learn about engine performance and design, design considerations, the principle of similitude, and its application.

Mapping Course Learning Outcomes (CLOs) with the PLOs

Course Learning Outcomes (CLO)	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10	PLO 11	PLO 12
CLO 1	✓				✓			✓				
CLO 2	✓								✓	✓		
CLO 3			✓			✓						
CLO 4		✓		✓			✓				✓	✓

Mapping Course Learning Outcomes (CLOs) with the Teaching-Leaning & Assessment Strategy

Course Learning Outcomes (CLO)	Teaching-Learning Strategy	Assessment Strategy
CLO 1	Lectures, Reference books	Class test, Mid Semester, Assignment, Final exam
CLO 2	Lecture handouts, Reference books	Class test, Mid Semester, Final exam
CLO 3	Video presentation, Lecture notes	Class performance, Assignment, Mid Semester, Final exam
CLO 4	Lectures, Reference books, Supplementary video	Team assignment, Final exam

ME 4123: Fluid Machinery

Credits 3.00 ***Contact hours: 3.0 hrs/week***

Rationale of the Course:

This course offers the students a basic knowledge of positive displacement and dynamic fluid machines with reference to their functional behavior and performance characteristics. By taking this course, the students should achieve a basic knowledge about the operation of positive displacement and dynamic fluid machines and be able to evaluate the main performance aspects.

Course Content: 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 Learning Outcomes (CLOs)

CLO1: To understand the basic laws denoting how hydraulic powers can be used
CLO2: To identify different types of fluid machines and their construction and, application
CLO3: To apply previously gained knowledge in identifying the action and their relation with the driving laws of the fluid machines
CLO4: To solve real world engineering problems and how to design these fluid machines as per requirements.

Mapping Course Learning Outcomes (CLOs) with the PLOs

Course Learning Outcomes (CLO)	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10	PLO 11	PLO 12
CLO 1	✓						✓					
CLO 2	✓		✓			✓	✓					
CLO 3	✓		✓		✓				✓			
CLO 4	✓	✓		✓			✓			✓	✓	✓

Mapping Course Learning Outcomes (CLOs) with the Teaching-Leaning & Assessment Strategy

Course Learning Outcomes (CLO)	Teaching-Learning Strategy	Assessment Strategy
CLO 1	Lecture, Reference books	Class test, Mid Semester Exam, Final Exam
CLO 2	Lecture, Lecture Handouts, Reference books	Class test, Mid Semester Exam, Assignment, Final Exam
CLO 3	Video Lecture, Reference books	Class Performance, Mid Semester Exam, Final Exam
CLO 4	Lecture, Reference books, Supplementary videos	Class Performance, Mid Semester Exam, Assignment, Final Exam

IPE 4103: Measurement and Quality Control
Credits 3.00 ***Contact hours: 3.0 hrs/week***
Rationale of the Course: This course will help students in acquiring profound knowledge of different measuring instruments and measurement processes. Basic probability theories and application like Frequency

distribution, measures of central tendency and dispersion, Bayes' Theorem, probability distributions, moment and moment generating functions, estimation, hypothesis testing etc. will also be taught in this course. Besides these they will also learn about real life case study on quality control like sampling and finding the most crucial quality factors in a manufacturing environment.

Course Content: Organization of inspection; Kinds of inspection; Standards of length; Scope and techniques for maintaining tolerances; Grades of manufacturing accuracy; Assembly-selective and interchangeable assembly; Gauging and limit gauges; Taylor's principles on limit gauges; Thread measurement and thread gauges; Abbey's principle; Measuring tools for angles and tapers; Instruments for checking straightness and flatness and for alignment test; Gear measurement; Measurement of surface finish, and surface roughness; Electrical and electronic measurements; Nondestructive test. 29 out of 35 Frequency distribution, measures of central tendency and dispersion; Concept of probability, conditional probability and Bayes' theorem; Probability distributions, moment and moment generating function; Sampling theory; Estimation; Hypothesis testing; Acceptance sampling plans - single, double, sequential, rectifying inspection plans; Control charts, X, R and C charts; Regression analysis; Analysis of variance; Concept of quality circle; TQM and TQC.

Course Learning Outcomes (CLOs)

CLO1: To understand fundamentals of different measuring instruments and measurement techniques.
CLO2: To acquire a strong foundation of statistics and probability concepts for being able to apply them in solving various industrial and quality control problems.
CLO3: To evaluate product quality based on the concepts learnt from this course.

Mapping Course Learning Outcomes (CLOs) with the PLOs

Course Learning Outcomes (CLO)	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10	PLO 11	PLO 12
CLO 1	✓		✓									✓
CLO 2	✓				✓							✓
CLO 3	✓							✓			✓	✓

Mapping Course Learning Outcomes (CLOs) with the Teaching-Leaning & Assessment Strategy

Course Learning Outcomes (CLO)	Teaching-Learning Strategy	Assessment Strategy
CLO 1	PPT, Lecture Notes, Reference Book.	Assignments, Mid Semester Examination, Class Test, Final Examination
CLO 2	PPT, Lecture Notes, Reference Book.	Assignments, Mid Semester Examination, Class Test, Final Examination
CLO 3	PPT, Lecture Notes, Reference Book.	Assignments, Mid Semester Examination, Class Test, Final Examination

ME 4105: Refrigeration and Building Mechanical System
Credits 3.00 ***Contact hours: 3.0 hrs/week***
Rationale of the Course:

To introduce students with various types of refrigeration and air-conditioning systems, as well as their components, and to prepare them to calculate the cooling demand of any room. In the meantime, introduce

students an environment that protects the building structure, creates safe and healthy surroundings for the occupants.

Course Content:

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 Learning Outcomes (CLOs)

CLO1: Demonstrate a thorough understanding of various refrigeration and air conditioning systems, as well as their components.
CLO2: Explain the concepts of air conditioning design and the factors that influence it, such as human comfort, weather and environmental factors, and the structure of the building.
CLO3: To understand the knowledge of load estimation and analysis, system psychometric analysis, and climatic data and its application.
CLO4: To gather knowledge on duct design methods and building mechanical system, Control systems, Fire Hazards: Firefighting equipment.

Mapping Course Learning Outcomes (CLOs) with the PLOs

Course Learning Outcomes (CLO)	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10	PLO 11	PLO 12
CLO 1	✓						✓					
CLO 2	✓	✓										
CLO 3	✓	✓								✓		✓
CLO 4	✓		✓				✓					✓

Mapping Course Learning Outcomes (CLOs) with the Teaching-Leaning & Assessment Strategy

Course Learning Outcomes (CLO)	Teaching-Learning Strategy	Assessment Strategy
CLO 1	PPT, Lecture Notes, Case study, Group discussion for problem solving, Reference Book.	Assignments, Mid Semester Examination, Class Test, Final Examination.
CLO 2	PPT, Lecture Notes, Case study, Group discussion for problem solving, Reference Book.	Assignments, Mid Semester Examination, Class Test, Final Examination.
CLO 3	PPT, Lecture Notes, Case study, Group discussion for problem solving, Reference Book.	Assignments, Mid Semester Examination, Class Test, Final Examination.

CLO 4	PPT, Lecture Notes, Case study, Group discussion for problem solving, Reference Book.	Assignments, Mid Semester Examination, Class Test, Final Examination.

ME 4102: Heat Engines Sessional
Credits 1.0 ***Contact hours: 2.0 hrs/week***

Rationale of the Course:

This course offers a practical experience to implement the theoretical knowledge gained from the course, titled as 'ME4101: Internal Combustion Engine'. With the help of this course, students have hand on experience with Heat engines before their graduation.

Course Content: Sessional based on ME 4101. The content of ME4101 is given below.

Introduction: basic engine types, operation, and testing; Idealized cycles and processes; IC engine fuels: Stoichiometry, properties, and tests; Combustion: SI engine, CI engine and gas turbines; Exhaust gas analysis and air pollution: pollution formation mechanism, measurement, and control; Fuel metering: SI engines, CI engines; Air capacity of engines: two and four-stroke cycles, naturally aspirated and supercharged; IC engine cooling and lubrication systems; Performance and design: Naturally aspirated engines and supercharged engines, design considerations, application of the principle of similitude in engine design. Compressors and turbines: compression processes, volumetric efficiency, multistage compression, intercooling; various types of compressors and gas turbines.

Course Learning Outcomes (CLOs)

CLO1: To understand the working principle of Heat engines through practical experience

CLO2: To apply the theoretical knowledge for calculating the performance of Heat engines, quality of exhaust gas

CLO3: To analyze the performance data and evaluate the Heat engines

Mapping Course Learning Outcomes (CLOs) with the PLOs

Course Learning Outcomes (CLO)	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10	PLO 11	PLO 12
CLO 1	✓									✓	✓	✓
CLO 2	✓	✓	✓							✓		
CLO 3	✓	✓	✓	✓	✓			✓				

Mapping Course Learning Outcomes (CLOs) with the Teaching-Leaning & Assessment Strategy

Course Learning Outcomes (CLO)	Teaching-Learning Strategy	Assessment Strategy
CLO 1	Lectures, Lab manual, Experimental Apparatus	Viva, Final Quiz, Lab Report

CLO 2	Lectures, Lab manual, Experimental Apparatus	Viva, Lab Report
CLO 3	Lectures, Lab manual, Experimental Apparatus	Viva, Final Quiz, Lab Report

ME 4124: Fluid Machinery Sessional
Credits 1.0 ***Contact hours: 2.0 hrs/week***

Rationale of the Course:

This course offers a practical experience to implement the theoretical knowledge gained from the course, titled as 'ME 4123: Fluid Machinery'. With the help of this course, students have hand on experience with fluid machineries before their graduation.

Course Content:

Sessional based on ME 4123. The content of ME 4123 is given below:

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 Learning Outcomes (CLOs)

CLO1: To understand the working principle of fluid machineries.

CLO2: To apply the knowledge in order to identify the problems associated with it.

CLO3: To evaluate the proper solving of the problems and examining the solution with the available data.

Mapping Course Learning Outcomes (CLOs) with the PLOs

Course Learning Outcomes (CLO)	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10	PLO 11	PLO 12
CLO 1	✓									✓	✓	✓
CLO 2	✓	✓	✓							✓		
CLO 3	✓	✓	✓	✓	✓			✓				

Mapping Course Learning Outcomes (CLOs) with the Teaching-Leaning & Assessment Strategy

Course Learning Outcomes (CLO)	Teaching-Learning Strategy	Assessment Strategy
CLO 1	Lectures, Lab manual, Experimental Apparatus	Viva, Final Quiz, Lab Report
CLO 2	Lectures, Lab manual, Experimental Apparatus	Viva, Lab Report

CLO 3	Lectures, Lab manual, Experimental Apparatus	Viva, Final Quiz, Lab Report

IPE 4104: Measurement and Quality Control Sessional
Credits 1.0 ***Contact hours: 2.0 hrs/week***

Rationale of the Course: This course will help students in acquiring practical knowledge of different measuring instruments and measurement processes. Basic probability theories and practical application like Frequency distribution, Checking of Normality, measures of central tendency and probability distributions, etc. will also be taught in this course. Besides these they will also learn about real life case study on quality control like sampling and finding the most crucial quality factors in a manufacturing environment.

Course Content:

Check the normality by X2 (Chi Square) test, Measurement of angle of Template, Measurement of Splines, Determination of radius of convex arc. Determination of radius of concave arc., Measurement of Screw thread by wire. Design and Implementation of a Lot By Lot Acceptance Sampling Plan, Calibration of Slip Gauges using Super micrometer, Measurement of propeller by using Picometer. Measurement of angles by a) 3 rollers and b) 2 rollers, Measurement of gear teeth by gear teeth Vernier Calipers, Measurement of Bore by, a) Two balls b) Pin gauge Measurement of Tapers: By rollers, Slip gauges and Micrometer, Ring gauge measurement by unequal Balls, Taper Plug measurement by Sine Bar and Dial Gauges.

Course Learning Outcomes (CLOs)

CLO1: To understand fundamentals of different measuring instruments and measurement techniques.
CLO2: To acquire a strong foundation of statistics and probability concepts for being able to apply them in solving various industrial and quality control problems.

CLO3: To evaluate product quality based on the concepts learnt from this course.

Mapping Course Learning Outcomes (CLOs) with the PLOs

Course Learning Outcomes (CLO)	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10	PLO 11	PLO 12
CLO 1	✓		✓									✓
CLO 2	✓				✓							✓
CLO 3	✓							✓			✓	✓

Mapping Course Learning Outcomes (CLOs) with the Teaching-Leaning & Assessment Strategy

Course Learning Outcomes (CLO)	Teaching-Learning Strategy	Assessment Strategy
CLO 1	PPT, Lecture Notes, Reference Book and Practical Instruments.	Lab Reports, Assignments, Final Quiz.
CLO 2	PPT, Lecture Notes, Reference Book and Practical Instruments.	Lab Reports, Assignments, Final Quiz.
CLO 3	PPT, Lecture Notes, Reference Book and Practical Instruments.	Lab Reports, Assignments, Final Quiz.

ME 4201: Automobile Engineering

Credits 3.00 ***Contact hours: 3.0 hrs/week***

Rationale of the Course:

This field of engineering offers wide range of opportunities for the students which includes automobile manufacturing industries, production plants, service stations, state road transport corporations, private transport companies, insurance companies, motor vehicle departments etc.

Course Content:

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: linear and angular inertia, braking effects, gyroscopic effects and reactions, tractive effort, and vehicle vibration; Resistance to vehicle motion: gradient resistance, aerodynamic resistance, rolling and frictional resistance; Development strategies for minimum resistance. Automotive transmission systems and power train: clutch, gear, differential, and final drives. Automotive safety: brakes; Reduction of injuries; Automotive body: materials and vehicle shape; springs and suspension; Steering system. Electrical systems: cranking motor, alternator, and lighting; Electronic control systems and indicators. Environmental considerations: vehicle emissions and control strategies; Noise pollution and control; Vehicle fuel economy. Testing of vehicle; Motor vehicle regulations.

Course Learning Outcomes (CLOs)

CLO1: To understand the basics of automobile history and its development.
CLO2: To develop the ability to explain various essential parts of an automobile like engine, clutch, brakes etc.
CLO3: To analyze and solve engine performance problem and make students conversant with vehicle performance and safety norms.
CLO4: To develop the ability to describe the working principle of various automobile systems like suspension systems, lubrication system electrical system etc.
CLO5: To Understand the environmental impact of automobile emissions & develop a strong base for understanding future developments in the automobile industry.

Mapping Course Learning Outcomes (CLOs) with the PLOs

Course Learning Outcomes (CLO)	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10	PLO 11	PLO 12
CLO 1	✓								✓		✓	
CLO 2		✓					✓			✓		
CLO 3	✓				✓			✓				✓
CLO 4		✓	✓				✓	✓				
CLO 5								✓	✓			

Mapping Course Learning Outcomes (CLOs) with the Teaching-Leaning & Assessment Strategy

Course Learning Outcomes (CLO)	Teaching-Learning Strategy	Assessment Strategy
CLO 1	PPT, WB, Tutorial	Mid Semester exam

CLO 2	PPT, WB, Tutorial	Mid Semester exam, Class test, Spot test
CLO 3	WB, Handout, Reference book	Mid Semester exam, Assignment
CLO 4	PPT, WB, Video	Mid Semester exam, Class test, Spot test Quizzes
CLO 5	PPT, WB, Reference book	Final semester exam, Class test, Quizzes

IPE 4205: Machine Tools
Credits 3.00 ***Contact hours: 3.0 hrs/week***

Rationale of the Course: The study of machine tools and machine processes are not the only manufacturing processes that you should have knowledge of. You should have general knowledge of process capabilities and limitations for manufacturing products for many industries made from all common engineering materials from plastics, ceramics, composites, elastomers, to exotic metal alloys,. Know the materials chemistry, metallurgy, heat treatments, plating processes, casting processes, molding processes, bonding processes, fastening methods, welding/fusion processes, riveting processes, coating processes, etc. This knowledge will allow you to efficiently design reliable products that can be easily made at the lowest possible cost and at the highest quality levels. This knowledge will significantly shorten the time from concept to market (speed to market) which is very important to cost control and gives your business a competitive advantage.

Course Content: Mechanical, electrical, hydraulic and pneumatic drives in machine tools; Bearings, slide ways, structure and control of machine tools; Detailed case study of engine lathe, turret lathe, milling machine, grinding machine, and gear shaping machine. Installation and acceptance tests of machine tools. Locating, principles and locators, clamps, dies, jigs/fixtures.

Course Learning Outcomes (CLOs)

CLO1: Understand Energy and Environment Perspectives of Bangladesh and the whole world as well as the importance of Ecology, Climate and Atmosphere.
CLO2: Understand Energy Sustainability, Energy Demand and Supply, Energy Economics
CLO3: Explain Environmental impacts of energy production, different pollutions, GHG emission and global environmental problems.

CLO4: Explain Energy conversion, transfer, transmission and storage methods, energy efficiency of buildings and available technologies to mitigate problems.

Mapping Course Learning Outcomes (CLOs) with the PLOs

Course Learning Outcomes (CLO)	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10	PLO 11	PLO 12
CLO 1	✓		✓	✓	✓	✓		✓			✓	✓
CLO 2	✓	✓			✓			✓		✓		
CLO 3	✓		✓	✓			✓			✓		✓
CLO 4	✓	✓			✓			✓				✓

Mapping Course Learning Outcomes (CLOs) with the Teaching-Leaning & Assessment Strategy

Course Learning Outcomes (CLO)	Teaching-Learning Strategy	Assessment Strategy

CLO 1	PPT, Lecture, Reference book, Case study	Mid Semester, Class Test, Final Exam
CLO 2	PPT, Lecture, Reference book, Case study	Class Test, Final Exam
CLO 3	PPT, Lecture, Reference book, Case study	Mid Semester, Class Test
CLO 4	PPT, Lecture, Reference book	Mid Semester, Class Test, Final Exam

ME 4204: Steam Laboratories Sessional
Credits 1.0 ***Contact hours: 2.0 hrs/week***

Rationale of the Course:

While performing sessional courses in this laboratory, students are able to performance testing of parallel and mixed flow double pipe heat exchanger, get practical knowledge about different parts of a boiler. With the knowledge of this course, students can learn about the practical application of boiler, performance test of boiler used in different sectors.

Course Content:

This lab consists of several experimental setups like double pipe heat exchanger, fire tube Boiler, cooling tower etc. about boiler accessories, mountings and about the water treatment plant for boiler feed water, they also know about the performance testing of a cooling tower.

Course Learning Outcomes (CLOs)

CLO1: To understand the working principle of boiler through practical experience

CLO2: To apply the theoretical knowledge for calculating the performance test of a boiler

CLO3: To analyze the performance data and evaluate the boiler

Mapping Course Learning Outcomes (CLOs) with the PLOs

Course Learning Outcomes (CLO)	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10	PLO 11	PLO 12
CLO 1	√									√	√	√
CLO 2	√	√	√							√		
CLO 3	√	√	√	√	√			√				

Mapping Course Learning Outcomes (CLOs) with the Teaching-Leaning & Assessment Strategy

Course Learning Outcomes (CLO)	Teaching-Learning Strategy	Assessment Strategy
CLO 1	Lectures, Lab manual, Experimental Apparatus	Viva, Final Quiz, Lab Report
CLO 2	Lectures, Lab manual, Experimental Apparatus	L Viva, Final Quiz, Lab Report
CLO 3	Lectures, Lab manual, Experimental Apparatus	Viva, Final Quiz, Lab Report

IPE 4206: Machine Tools Sessional
Credits 0.75 ***Contact hours: 1.5 hrs/week***

Rationale of the Course: The study of machine tools and machine processes are not the only manufacturing processes that you should have knowledge of. You should have general knowledge of process capabilities and limitations for manufacturing products for many industries made from all common engineering materials from plastics, ceramics, composites, elastomers, to exotic metal alloys,. Know the materials chemistry, metallurgy, heat treatments, plating processes, casting processes, molding processes, bonding processes, fastening methods, welding/fusion processes, riveting processes, coating processes, etc. This knowledge will allow you to efficiently design reliable products that can be easily made at the lowest possible cost and at the highest quality levels. This knowledge will significantly shorten the time from concept to market (speed to market) which is very important to cost control and gives your business a competitive advantage.

Course Content:

Experiments based on IPE 4205.

Course Learning Outcomes (CLOs)
CLO1: Identify basic parts of machine tools including lathe, shaper, planer, drilling, boring, milling and grinding machine.
CLO2: Identify operations of machine tools including lathe, shaper, planer, drilling, boring, milling and grinding machine.
CLO3: Select a machining operation and corresponding machine tool for a specific application in real time
CLO4: Maintain all the safety instruction to avoid any types of hazard.

Mapping Course Learning Outcomes (CLOs) with the PLOs

Course Learning Outcomes (CLO)	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10	PLO 11	PLO 12
CLO 1	✓										✓	✓
CLO 2	✓	✓	✓				✓	✓			✓	✓
CLO 3	✓	✓	✓	✓	✓	✓	✓		✓			✓
CLO 4	✓					✓	✓			✓	✓	✓

Mapping Course Learning Outcomes (CLOs) with the Teaching-Leaning & Assessment Strategy

Course Learning Outcomes (CLO)	Teaching-Learning Strategy	Assessment Strategy
CLO 1	Lab Manual, Experiment, Lecture	Lab final, Viva, Quiz, Lab report
CLO 2	Lab Manual, Experiment, Lecture	Lab final, Viva, Quiz, Lab report
CLO 3	Lab Manual, Experiment, Lecture	Lab final, Viva, Quiz, Lab report
CLO 4	Lab Manual, Experiment, Lecture	Lab final, Viva, Quiz, Lab report

ME 4107: Renewable Energy
Credits 3.00 ***Contact hours: 3.0 hrs/week***

Rationale of the Course:

This course will give students a vast knowledge about renewable energy sources, overall situation of the energy resources in the world, prospects of renewable energy sources in Bangladesh, effects of energy resources in society and environment.

Course Content:

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 renewables 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 Learning Outcomes (CLOs)

CLO1: To understand the fundamentals of Renewable Energy resources.

CLO2: To learn about different types of Renewable Energy resources and their prospects.

CLO3: To learn about the environmental and ecological constraints on the utilization of these possible resources.

Mapping Course Learning Outcomes (CLOs) with the PLOs

Course Learning Outcomes (CLO)	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10	PLO 11	PLO 12
CLO 1	√				√				√			
CLO 2	√				√			√	√			√
CLO 3	√	√			√				√	√		

Mapping Course Learning Outcomes (CLOs) with the Teaching-Leaning & Assessment Strategy

Course Learning Outcomes (CLO)	Teaching-Learning Strategy	Assessment Strategy
CLO 1	PPT, Lecture Notes, Reference Book.	Assignments, Mid Semester Examination, Class Test, Final Examination
CLO 2	PPT, Lecture Notes, Reference Book.	Assignments, Mid Semester Examination, Class Test, Final Examination
CLO 3	PPT, Lecture Notes, Reference Book.	Assignments, Mid Semester Examination, Class Test, Final Examination

ME 4109: Aerodynamics
Credits 3.00 ***Contact hours: 3.0 hrs/week***
Rationale of the Course:

This field of engineering offers wide range of opportunities for the students which includes basic function and flows, basic theorem, service stations, Static performance problem, stability and control etc.

Course Content:

Inviscid incompressible flow to include potential function, stream function, circulation and basic flows; Kutta-Joukowski theorem; Aero foil 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 Learning Outcomes (CLOs)

CLO1: Remember and understand the basic Inviscid incompressible flow to include potential function, stream function, circulation and basic flows.
CLO2: Apply various method using these Kutta-Joukowski theorem; Aero foil theory and wing theory to solve problems.
CLO3: Analyze the Drag, aircraft propulsion and propeller, Static performance problem, Special performance problem.

CLO4: Evaluate the appropriate principle to apply when solving stability and control.

Mapping Course Learning Outcomes (CLOs) with the PLOs

Course Learning Outcomes (CLO)	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10	PLO 11	PLO 12
CLO 1	√		√				√					
CLO 2					√			√				
CLO 3	√							√				
CLO 4			√	√						√	√	

Mapping Course Learning Outcomes (CLOs) with the Teaching-Leaning & Assessment Strategy

Course Learning Outcomes (CLO)	Teaching-Learning Strategy	Assessment Strategy
CLO 1	PPT, Lecture Notes, Reference Book	Mid Semester Examination, Class Test, Assignment, Final Examination
CLO 2	PPT, Lecture Notes, Reference Book	Mid Semester Examination, Class Test, Assignment, Final Examination
CLO 3	PPT, Lecture Notes, Reference Book	Mid Semester Examination, Class Test, Assignment, Final Examination
CLO 4	PPT, Lecture Notes, Reference Book	Mid Semester Examination, Class Test, Assignment, Final Examination

ME 4111: Robotics
Credits 3.00 ***Contact hours: 3.0 hrs/week***
Rationale of the Course:

This course is an overview of robotic and automated systems technology. The student will be introduced to basic manufacturing techniques, robot terminology, different types of automation, safety, basic robotic programming, interfacing robotic communications, automated work cells, and robotic applications. Robot operations and programming fundamentals will be applied by the students.

Course Contents:

This course is an overview of robotic and automated systems technology. The student will be introduced to basic manufacturing techniques, robot terminology, different types of automation, safety, basic robotic programming, interfacing robotic communications, automated work cells, and robotic applications. Robot operations and programming fundamentals will be applied by the students.

Course Learning Outcomes(CLOs)

CLO 1: Summarize the essential characteristics of industrial robotics
CLO 2: Classify the devices and role for robotics safety
CLO 3: Explain the classification of robotic systems
CLO 4: Explain the classification by arm geometry of robotic systems
Mapping Course Learning Outcomes (CLOs) with the PLOs

Course Learning Outcomes (CLO)	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10	PLO 11	PLO 12
CLO 1	✓					✓		✓				✓
CLO 2				✓					✓			
CLO 3	✓								✓		✓	
CLO 4				✓				✓				✓

Mapping Course Learning Outcomes (CLOs) with the Teaching-Leaning & Assessment Strategy

Course Learning Outcomes (CLO)	Teaching-Learning Strategy	Assessment Strategy
CLO 1	Lecture, Presentation, Delivering pdf, slides	Quiz, assignment, mid exam
CLO 2	Lecture, Presentation, Delivering pdf, slides	Quiz, assignment, mid exam
CLO 3	Lecture, Presentation, Delivering pdf, slides	Quiz, assignment, final exam
CLO 4	Lecture, Presentation, Delivering pdf, slides	Quiz, assignment, final exam

ME 4115: Petroleum Engineering
Credits 3.00 ***Contact hours: 3.0 hrs/week***

Rationale of the Course: This course offers a general overview of hydrocarbon reserves in Bangladesh. Students will learn about the fuel reserves of Bangladesh, their physical and chemical compositions, how to explore new reserves, and how they are extracted.

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

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

Course Learning Outcomes (CLOs)

CLO1: To understand the importance and types of hydrocarbons.
CLO2: To be able to understand the physical and chemical properties of rocks.
CLO3: To learn about drilling machines and their types.
CLO4: To learn about the extraction of petroleum.

Mapping Course Learning Outcomes (CLOs) with the PLOs

Course Learning Outcomes (CLO)	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10	PLO 11	PLO 12
CLO 1	✓					✓		✓				✓
CLO 2				✓					✓			
CLO 3	✓	✓							✓	✓	✓	
CLO 4		✓	✓	✓	✓		✓	✓				✓

Mapping Course Learning Outcomes (CLOs) with the Teaching-Leaning & Assessment Strategy

Course Learning Outcomes (CLO)	Teaching-Learning Strategy	Assessment Strategy
CLO 1	Lecture, Presentation, Delivering pdf, slides	Quiz, assignment, mid and final exam
CLO 2	Lecture, Presentation, Delivering pdf, slides	Quiz, assignment, mid and final exam
CLO 3	Lecture, Presentation, Delivering pdf, slides	Quiz, assignment, mid and final exam
CLO 4	Lecture, Presentation, Delivering pdf, slides	Quiz, assignment, mid and final exam

ME 4119: Mechatronics
Credits 3.00 ***Contact hours: 3.0 hrs/week***
Rationale of the Course:

As of late, mechatronics has become more of a popular buzzword for the latest and greatest in machine-based technologies, but there seems to be some grey area for what does and fall under that umbrella term. In short, mechatronics is a term that applies to a wide variety of engineering fields—including mechanical engineering, electrical engineering, telecommunications engineering, control engineering and computer engineering. As mechatronics becomes a more obvious and necessary outlet for the engineering field, it will continue to expand the manufacturing market as well. The manufacturing field is experiencing a skills gap, as more and more jobs with higher required skills open up and there aren't enough qualified people to employ them. Mechatronics provides the bridge manufacturing needs, by combining engineering in its various forms with technical and mechanical skills. Engineers can use classes in mechatronics to cross over into manufacturing with ease.

Course Content: Introduction; Organization structure; System concept; Mechanical, electrical, electronic and software components; Process; Software based tools; Virtual instrumentation; CAD; CAM; Computer 34 out of 35 integrated systems; Computer interfacing; Manipulators; Actuator types; Sensors and vision systems; Smart robots; Artificial intelligence; Factory, office, and home automation; Future trend.

Course Learning Outcomes (CLOs)

CLO1: Identification of key elements of mechatronics system and its representation in terms of block diagram
CLO2: Interfacing of Sensors, Actuators using appropriate DAQ micro-controller
CLO3: Understanding the concept of signal processing and use of interfacing systems such as ADC, DAC, digital I/O
CLO4: - Time and Frequency domain analysis of system model (for control application)

Mapping Course Learning Outcomes (CLOs) with the PLOs

Course Learning Outcomes (CLO)	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10	PLO 11	PLO 12
CLO 1	✓	✓			✓			✓		✓	✓	✓
CLO 2	✓	✓		✓	✓		✓		✓			✓
CLO 3	✓		✓			✓		✓			✓	
CLO 4	✓			✓			✓			✓		✓

Mapping Course Learning Outcomes (CLOs) with the Teaching-Leaning & Assessment Strategy

Course Learning Outcomes (CLO)	Teaching-Learning Strategy	Assessment Strategy
CLO 1	PPT, Lecture, Reference book	Mid Semester, Class Test
CLO 2	PPT, Lecture, Reference book	Mid Semester, Class Test, Assignment
CLO 3	PPT, Lecture, Reference book	Class Test, Final Exam
CLO 4	PPT, Lecture, Reference book	Assignment, Final Exam

ME 4113: Control Engineering
Credits 3.00 ***Contact hours: 3.0 hrs/week***
Rationale of the Course:

Optional Theoretical course to be chosen by students who like to go for higher study in marine engineering or controls. By learning this course student will be able to know the basics and systems on how controlling works for marine and aviation technologies.

Course Content: 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 Learning Outcomes (CLOs)

CLO1: To understand the develop of mathematical model of the physical systems.
CLO2: Apply various methods for design the various kinds of compensator.
CLO3: Analyze the stability of the closed and open loop systems.
CLO4: Evaluate the response of the closed and open loop systems.

Mapping Course Learning Outcomes (CLOs) with the PLOs

Course Learning Outcomes (CLO)	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10	PLO 11	PLO 12
CLO 1		√			√				√			
CLO 2	√	√			√			√				
CLO 3	√			√	√			√				
CLO 4		√	√			√				√		

Mapping Course Learning Outcomes (CLOs) with the Teaching-Leaning & Assessment Strategy

Course Learning Outcomes (CLO)	Teaching-Learning Strategy	Assessment Strategy
CLO 1	PPT, Lecture Notes, Reference Book	Mid Semester Examination, Class Test, Assignment
CLO 2	PPT, Lecture Notes, Reference Book	Mid Semester Examination, Class Test, Assignment
CLO 3	PPT, Lecture Notes, Reference Book	Assignment, Final Examination
CLO 4	PPT, Lecture Notes, Reference Book	Class Test, Assignment, Final Examination

ME 4117: Noise and Vibration
Credits 3.00 ***Contact hours: 3.0 hrs/week***

Rationale of the Course

The noise and vibration control field represents a growing aspect of the Mechanical Engineering practice that has been gaining momentum in the recent decades. More and more, we find that engineers are called upon to resolve problems associated with excessive vibration levels and/or excessive production of noise. Designing and developing quiet products that meet the needs of the customer at minimum cost is of paramount importance. Mechanical equipment, such as cooling towers, generates noise and vibration during its normal operation. It is an important aspect of the building design to control the undesirable noise and vibration. This course provides the criteria and guidance required for design and construction of those features related to noise and vibration control of mechanical equipment systems most commonly encountered

Course Content:

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 Learning Outcomes:

After the successful completion of the course, students will be able to:
CLO 1: Students will understand the basic concepts of vibration and noise control and be able to design systems taking accordingly.

CLO 2: Students will be able to simulate vibrations generated by rods, bars and beams using finite element method.

CLO 3: Students will be able to perform Spatial, Modal and Response models of vibrating systems.

CLO 4: Students will be able to measure sound and vibrations using various sensors and will learn to control them.

Mapping Course Learning Outcomes (CLOs) with PLOs

Course Learning Outcomes (CLO)	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10	PLO 11	PLO 12
CLO 1		√					√	√				√
CLO 2		√						√				
CLO 3							√					
CLO 4		√				√	√					

Mapping Course Learning Outcomes (CLOs) with the Teaching-Learning and Assessment Strategy

CLOs	Teaching-Learning Strategy	Assessment Strategy
CLO 1	Lectures, Discussion with the students, Question and Answer Session, Interactive teaching, writing reflection note on class lecture, report writing.	Class test, Quiz test, Mid Exam
CLO 2	Lectures, Discussion with the students, Question and Answer Session, Problems solving in the class, Interactive teaching.	Class test, Quiz test, Mid Exam
CLO 3	Discussion, Question and Answer Session, Problems solving	Class test, Quiz test, Final Exam
CLO 4	Lectures, Discussion, Question and Answer Session, Problems solving, Report writing.	Class test, Quiz test, Final Exam

ME 4205: **Energy and Environment**

Credits 3.00 ***Contact hours: 3.0 hrs/week***

Rationale of the Course: This course will attempt to provide students with a broad understanding of the energy system, its challenges - especially with respect to the environment, and possible paths to a sustainable energy future. The course will deal with topics such as the direction of future energy use, the societal and environmental well-being, and how we might improve our current energy system moving forward. The course will examine energy issues and different technologies that pertain to the environment.

Course Content: Energy sources and utilization; Principles of Energy conversion and storage; Building thermal-energy principle and optimization; Energy economy tools and techniques; Environmental impacts of energy conversion; Environmental economics and management; Case studies.

Course Learning Outcomes (CLOs)

CLO1: Understand Energy and Environment Perspectives of Bangladesh and the whole world as well as the importance of Ecology, Climate and Atmosphere.

CLO2: Understand Energy Sustainability, Energy Demand and Supply, Energy Economics

CLO3: Explain Environmental impacts of energy production, different pollutions, GHG emission and global environmental problems.
CLO4: Explain Energy conversion, transfer, transmission and storage methods, energy efficiency of buildings and available technologies to mitigate problems.

Mapping Course Learning Outcomes (CLOs) with the PLOs

Course Learning Outcomes (CLO)	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10	PLO 11	PLO 12
CLO 1				✓		✓			✓	✓		✓
CLO 2	✓	✓	✓		✓	✓	✓	✓			✓	✓
CLO 3	✓			✓	✓	✓	✓		✓			✓
CLO 4	✓	✓	✓		✓	✓	✓	✓		✓	✓	✓

Mapping Course Learning Outcomes (CLOs) with the Teaching-Leaning & Assessment Strategy

Course Learning Outcomes (CLO)	Teaching-Learning Strategy	Assessment Strategy
CLO 1	PPT, Lecture Notes, Reference Book, Students Feedback	Mid Semester Examination, Class Test, Final Examination
CLO 2	PPT, Lecture Notes, Reference Book, Students Feedback	Mid Semester Examination, Assignment, Final Examination
CLO 3	PPT, Lecture Notes, Reference Book, Students Feedback	Mid Semester Examination, Class Test, Final Examination
CLO 4	PPT, Lecture Notes, Reference Book, Students Feedback	Mid Semester Examination, Presentation, Final Examination

ME 4207: Composite Materials
Credits 3.00 ***Contact hours: 3.0 hrs/week***

Rationale of the Course: This course aims to make the students acquainted with different types of composite materials so that they can compare within them and choose appropriate material. Also, they will learn to perform performance test and failure analysis.

Course Content: 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 Learning Outcomes (CLOs)

CLO1: To introduce students with different composite materials and associated terminologies
CLO2: To design and perform failure analysis of composite materials
CLO3: To conduct performance analysis of different composite structures
CLO4: To be able to compare between different composite materials

Mapping Course Learning Outcomes (CLOs) with the PLOs

Course Learning Outcomes (CLO)	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10	PLO 11	PLO 12
CLO 1							✓				✓	
CLO 2			✓		✓							
CLO 3					✓		✓					
CLO 4										✓		✓

Mapping Course Learning Outcomes (CLOs) with the Teaching-Leaning & Assessment Strategy

Course Learning Outcomes (CLO)	Teaching-Learning Strategy	Assessment Strategy
CLO 1	Lectures, Presentation	Quiz, Assignment, Mid & Final Exam
CLO 2	Lectures, Presentation	Quiz, Assignment, Mid & Final Exam
CLO 3	Lectures, Presentation	Quiz, Assignment, Mid & Final Exam
CLO 4	Lectures, Presentation	Quiz, Assignment, Mid & Final Exam

ME 4209: Flight Dynamics
Credits 3.00 ***Contact hours: 3.0 hrs/week***
Rationale of the Course:

This course offers advanced knowledge about aerodynamics which helps students to know about aeronautical engineering. After finishing this course the students will have a good knowledge on the dynamics and controls of flight.

Course Content:

Aviation history, point mass dynamic and forces. Configuration of Aerodynamics, crushing flight performance, Gliding, Climbing and Turning Performance, Aircraft equation of motion, Linearized equation and modes of motion, Longitudinal dynamics, Lateral directional dynamics. Analysis of time response, Root Locus analysis of parameter variations, Transfer functions and frequency response. Configuration and power effect on flight stability, Aircraft control device and systems, Flight testing, Advanced problems on longitudinal dynamics and lateral directional dynamics.
Flying qualities criteria, problems of high speed and altitude, Maneuvering and aero elasticity, Atmosphere hazard to flight.

Jet & propellers, Jet Propulsion engine, Turbojet engine, Turbo fan, Ramjet engine and Rocket engine.

Mapping Course Learning Outcomes (CLOs) with the PLOs.

Course Learning Outcomes (CLOs)

CLO1: To understand fundamental definitions of flight dynamics
CLO2: To understand various formulae of flight dynamics with their derivations.
CLO3: To apply the knowledge of CL01 and CLO2 in various problems.

Course Learning Outcomes (CLO)	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10	PLO 11	PLO 12
CLO 1	√				√							
CLO 2	√				√			√				√
CLO 3			√		√					√		

Mapping Course Learning Outcomes (CLOs) with the Teaching-Leaning & Assessment Strategy

Course Learning Outcomes (CLO)	Teaching-Learning Strategy	Assessment Strategy
CLO 1	Lecture Notes, White board, Reference Book	Class test, Mid Semester
CLO 2	Lecture Notes, White board, Reference Book	Assignment, Class test, Mid Semester
CLO 3	Lecture Notes, White board, Reference Book	Final Exam, Assignment, Class test.

ME 4215: Gas Dynamics
Credits 3.00 ***Contact hours: 3.0 hrs/week***
Rationale of the Course:

This course will give students a vast knowledge about flow in converging diverging nozzles, different types of compressible flows and their applications, Formation of shock waves and problems due to this.

Course Content:

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 Learning Outcomes (CLOs)

CLO1: To understand the fundamentals of Gas Dynamics.

CLO2: To learn about different types of compressible flows and their applications.

CLO3: To learn about the impacts of shock waves.

Mapping Course Learning Outcomes (CLOs) with the PLOs

Course Learning Outcomes (CLO)	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10	PLO 11	PLO 12
CLO 1	√				√				√			
CLO 2	√				√			√	√			√

CLO 3	√	√			√				√	√		

Mapping Course Learning Outcomes (CLOs) with the Teaching-Leaning & Assessment Strategy

Course Learning Outcomes (CLO)	Teaching-Learning Strategy	Assessment Strategy
CLO 1	PPT, Lecture Notes, Reference Book.	Assignments, Mid Semester Examination, Class Test, Final Examination
CLO 2	PPT, Lecture Notes, Reference Book.	Assignments, Mid Semester Examination, Class Test, Final Examination
CLO 3	PPT, Lecture Notes, Reference Book.	Assignments, Mid Semester Examination, Class Test, Final Examination

ME 4217: Fluidics
Credits 3.00 ***Contact hours: 3.0 hrs/week***
Rationale of the Course:

This course offers basic insight into hydraulic and pneumatic components and systems. With the knowledge of this course, students can do the system modelling, can do the stability test and can also do the compensation of the system.

Course Content:

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

Course Learning Outcomes (CLOs)

CLO1: To understand the fundamental of fluidics.
CLO2: To apply the knowledge in order to identify the problems associated with the system modelling.
CLO3: To evaluate the proper solving of the problems and examining the solution with the available data.

Mapping Course Learning Outcomes (CLOs) with the PLOs

Course Learning Outcomes (CLO)	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10	PLO 11	PLO 12
CLO 1	✓									✓	✓	✓
CLO 2	✓		✓	✓	✓			✓		✓		
CLO 3	✓		✓	✓	✓			✓		✓		

Mapping Course Learning Outcomes (CLOs) with the Teaching-Leaning & Assessment Strategy

Course Learning Outcomes (CLO)	Teaching-Learning Strategy	Assessment Strategy
CLO 1	PPT, Lecture Notes, Reference Book.	Mid Semester Examination, Class Test
CLO 2	PPT, Lecture Notes, Reference Book, Case Study.	Mid Semester Examination, Assignment, Class Test
CLO 3	PPT, Lecture Notes, Reference Book, Case Study	Assignment, Class Test, Final Examination

ME 4219: Design of Fluid Machines
Credits 3.00 ***Contact hours: 3.0 hrs/week***
Rationale of the Course:

While performing this course, students are able to learn hydraulic circuit design with consideration to efficient use of energy. This means choosing components of an appropriate size to handle the flow of the system with little or no pressure drop, which spells doom for servo valves. This course also helps them to understand the behavior of fluid under various forces and at different atmospheric conditions, and to select the proper fluid for various applications.

Course Content:

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 Learning Outcomes (CLOs)

CLO1: To understand the basic design concept of fluid machines
CLO2: To apply the theoretical knowledge for calculating the performance test of fluid machines
CLO3: To analyze the performance data and evaluate the hydraulic machines

Mapping Course Learning Outcomes (CLOs) with the PLOs

Course Learning Outcomes (CLO)	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10	PLO 11	PLO 12
CLO 1	√										√	√
CLO 2	√	√	√							√		
CLO 3		√		√	√			√				

Mapping Course Learning Outcomes (CLOs) with the Teaching-Leaning & Assessment Strategy

Course Learning Outcomes (CLO)	Teaching-Learning Strategy	Assessment Strategy
CLO 1	PPT, Lecture Notes, Reference Book	Mid Semester Examination, Class Test
CLO 2	PPT, Lecture Notes, Reference Book	Mid Semester Examination, Assignment, Class Test,
CLO 3	PPT, Lecture Notes, Reference Book	Assignment, Class Test, Final Examination

EEE 4221: Electrical Machines
Credits 3.00 ***Contact hours: 3.0 hrs/week***

Rationale of the Course:

Various DC and AC electrical machines are covered in this course. The topics taught in this course have significant importance in industrial and other real-life applications. The primary intent of this course is to deliver in-depth knowledge on the construction, working principles, characteristics, and application of different transformers, motors, and generators.

Course Content:

Transformer: Construction, operating principle, different cooling methods, ideal transformer, polarity of transformer windings, equivalent circuit of a transformer, determination of equivalent circuit parameters by tests, losses and loss minimization techniques, efficiency, voltage regulation, transformer parallel operation, autotransformer.

Three-phase Transformer: Construction, connection configuration, vector group, parallel operation, power application etc.

DC Generator: Principle, types, performances, and characteristics.

DC Motor: Principles, types of motor, performances, speed control, starters, and characteristics

Three-phase Induction Motor: Rotating magnetic field, construction, principle of operation, squirrel cage and wound rotor, equivalent circuit, determination of parameters by tests, synchronous speed, slip and its effect on rotor frequency and voltage, torque, mechanical power and developed torque, torque-speed characteristic, losses, efficiency and power factor, shaping of torque speed characteristic, methods of braking, speed control and starting.

Single-phase Induction Motor: Operation, double revolving field theory, starting methods, equivalent circuit, torque-speed characteristic and performance calculation.

Induction generator: Working principle and operation, characteristics, voltage build up, applications.

Course Learning Outcomes (CLOs)

CLO1: Illustrate the basic principle, constructional feature and application of transformer, induction motors and induction generator.
CLO2: Analyze the behavior of the machines at different operating conditions.
CLO3: Evaluate the performance of different electrical machines.

Mapping Course Learning Outcomes (CLOs) with the PLOs

Course Learning Outcomes (CLO)	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10	PLO 11	PLO 12
CLO 1	✓											
CLO 2		✓	✓		✓		✓					
CLO 3			✓		✓			✓				

Mapping Course Learning Outcomes (CLOs) with the Teaching-Leaning & Assessment Strategy

Course Learning Outcomes (CLO)	Teaching-Learning Strategy	Assessment Strategy
CLO 1	Lecture Notes, Handouts, Reference Book	Mid Semester Examination, Class Test
CLO 2	PPT, Lecture Notes, Reference Book	Mid Semester Examination, Assignment, Class Test,
CLO 3	PPT, Handouts, Lecture Notes, Reference Book	Assignment, Class Test, Final Examination

ME 4211: Bio-Engineering
Credits 3.00 ***Contact hours: 3.0 hrs/week***

Rationale of the Course:

With technology advancing and the demand for cutting-edge medical equipment and devices expanding, biomedical engineering, sometimes called bioengineering, is a rapidly growing field. As our population lives longer, the demand for biomedical devices and procedures is expected to grow. With expertise spanning physiology, biology, healthcare and health informatics, mechanics, and engineering, biomedical engineers can combine their diverse skills to create solutions to continuing worldwide health issues, helping to change how patients are treated and lowering the cost of care.

Course Content:

Introduction; General configuration of biosensor; Types of biosensors; Basic principle and instrumentation of different types of biosensors: electrochemical, optical, piezoelectric, magnetic and calorimetric biosensors; Advance materials and techniques for developing biosensors, diagnostics and therapeutics; Recent advances in bio-based sensors and diagnostics. Introduction; Principles of regenerative medicine; Tissue engineering approaches, its need and current available technologies; Biomaterials in tissue engineering, biomaterial properties, biodegradability and compatibility; 3D scaffold processing techniques; Stem cells, primary cells and cell lines, their culturing and differentiation; Cell-material interactions; Bioreactors in tissue regeneration; 3D in vitro disease models; Drug delivery, drug delivery formats; Recent applications in regenerative medicine.

Course Learning Outcomes:

After the successful completion of the course, students will be able to:
CLO 1: Students will understand the basic concepts of biosensors, Tissue Engineering, Stem cells and be able to design systems taking accordingly.

CLO 2: Students will be able to simulate engineered tissue and its use in regenerative medicine.
CLO 3: Students will be able to perform modeling of drug delivery system according to application.

CLO 4: Students will be able to fabricate various biosensors and will learn to apply them.

Mapping Course Learning Outcomes (CLOs) with PLOs

Course Learning Outcomes (CLO)	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10	PLO 11	PLO 12
CLO 1		√					√	√				√
CLO 2		√						√				
CLO 3							√					

CLO 4		√				√	√					

Mapping Course Learning Outcomes (CLOs) with the Teaching-Learning and Assessment Strategy

CLOs	Teaching-Learning Strategy	Assessment Strategy
CLO 1	Lectures, Discussion, Question and Answer Session, Interactive teaching, writing reflection note on class lecture, report writing.	Class test Assignment, Mid Semester Exam
CLO 2	Lectures, Discussion, Question and Answer Session, Problems solving, Interactive teaching.	Class test Quiz test Mid Semester Exam
CLO 3	Discussion with the students, Question and Answer Session, Problems solving in the class	Class test Quiz test, Final Exam
CLO 4	Lectures, Discussion, Question and Answer Session, Problems solving, report writing.	Class test, Assignment Final Exam

ME 4213: Nuclear Engineering
Credits 3.00 ***Contact hours: 3.0 hrs/week***
Rationale of the Course:

Nuclear engineering concerns with the science of nuclear processes and their application to the development of various technologies. Nuclear processes are fundamental in the medical diagnosis and treatment fields, and in basic and applied research concerning accelerator, laser and superconducting magnetic systems. Currently, the major commercial application is the utilization of nuclear fission energy for the production of electricity. Therefore, nuclear engineers are concerned with maintaining expertise in the design, development and safe operation of advanced fission reactors, such as Generation IV reactors, developing both institutional and technical options for a safe handling of radioactive waste and nuclear materials management, and in fostering research in nuclear science and applications, with emphasis on and not limited to bioengineering, detection and instrumentation and environmental science.

Course Content:

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

Course Learning Outcomes:

After the successful completion of the course, students will be able to:
CLO 1: Students will understand the basic concepts of nuclear reactions and be able to analyze nuclear energy system accordingly.

CLO 2: Students will be able to simulate thermal hydraulics of nuclear energy system using finite element method.
CLO 3: Students will be able to perform word energy resources analysis.

CLO 4: Students will be able to comprehend basic working principle of nuclear power plant and how to prevent potential nuclear accidents from previous studies.

Mapping Course Learning Outcomes (CLOs) with PLOs

Course Learning Outcomes (CLO)	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10	PLO 11	PLO 12
CLO 1		√					√	√				√
CLO 2		√						√				
CLO 3							√					
CLO 4		√				√	√					

Mapping Course Learning Outcomes (CLOs) with the Teaching-Learning and Assessment Strategy

CLOs	Teaching-Learning Strategy	Assessment Strategy
CLO 1	Lectures, Discussion, Question and Answer Session, Interactive teaching, Writing reflection note on class lecture, report writing.	Class test, Assignment, Mid Semester Exam
CLO 2	Lectures, Discussion, Question and Answer Session, Problems solving, Interactive teaching	Class test, Assignment, Mid Semester Exam
CLO 3	Discussion, Question and Answer Session, Problems solving	Class test, Quiz test, Final Exam
CLO 4	Lectures, Discussion, Question and Answer Session, Problems solving, report writing.	Class test, Assignment, Final Exam

ME 4000: Project & Thesis

Credits: 6.00 ***Contact hours: 6.0 hrs. /week***

Rationale of the Course:

This is one of the major and final evolutionary course. Student will learn how to solve real world practical and theoretical problem with structured research and independent study. They will also demonstrate team work to solve a complex task.

Course Content:

Experimental and theoretical investigation of various topics in electrical machines, Power station, Electronic devices and circuits, Power electronics, Digital circuits, Microprocessors, Communication etc. The students will be required to submit thesis/project report at the end of the work.

Course Learning Outcomes:

CLO1: To be able to identify problem using associated Engineering knowledge.
CLO2: To be able to criticize others research outcomes to achieve new or modified idea.
CLO3: To formulate a plan for research outcomes and construct a successful project
CLO4: To be capable of analyzing the research outcomes by verifying with others work.

Mapping Course Learning Outcomes (CLOs) with PLOs

Course Learning Outcomes (CLO)	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10	PLO 11	PLO 12
CLO 1	√	√										
CLO 2			√					√				
CLO 3					√		√			√	√	
CLO 4						√						√

Mapping Course Learning Outcomes (CLOs) with the Teaching-Learning and Assessment Strategy

CLOs	Teaching-Learning Strategy	Assessment Strategy
CLO 1	Discussion with the students, Question and Answer Session, Interactive teaching, report writing	Presentation, Viva, Report Writing
CLO 2	Discussion with the students, Question and Answer Session, Interactive teaching, report writing	Presentation, Viva, Report Writing
CLO 3	Discussion with the students, Question and Answer Session, Interactive teaching, report writing	Presentation, Viva, Report Writing
CLO 4	Discussion with the students, Question and Answer Session, Interactive teaching, report writing	Presentation, Viva, Report Writing

Part D

20. Grading/Evaluation

1) Grading Scale

The letter grade system shall be used to assess the performance of the student and shall be as follows:

Numerical grade	Letter Grade
80% or above	A+ (A plus)
75% to less than 80%	A
70% to less than 75%	A- (A minus)
65% to less than 70%	B+ (B plus)
60% to less than 65%	B
55% to less than 60%	B- (B minus)
50% to less than 55%	C+ (C plus)
45% to less than 50%	C
40% to less than 45 %	D
Less than 40%	F
Continuous assessment	Cont (“Cont” is used for a course extended over two regular Semesters, such as project/thesis etc.)
Withdrawal	W
Withheld	Wh

Incomplete	I
Self-Study	SS
Repeat	Rt
Supplementary	Sp
Improvement	IM
Retake	R (X in result will denote absent in both Mid-Semester and Semester Final Exam.)
Non Credit Course	S/U (Satisfactory/Unsatisfactory)

2) Grades

Grade point	**Assessment**
4.00	Outstanding
3.75	Excellent
3.50	Very Good
3.25	Good
3.00	Above Average
2.75	Average
2.50	Below Average
2.25	Poor
2.00	Very Poor/Pass
0.00	Fail

3) Grade Point Average (GPA) and Cumulative Grade Point Average (CGPA):

Grade point average (GPA) is the weighted average of the grade points obtained in all the courses passed/completed by a student in a Semester. 'F' grades will not be counted for GPA calculation. GPA of a Semester will be calculated as follows:

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

where n is the total number of courses passed by the student, C_i is the number of credits allotted to a particular course *i* and G_i is the grade point corresponding to the grade awarded for *i*-th course. Cumulative Grade Point Average (CGPA) gives the cumulative performance of the student from first Semester up to any other Semester to which it refers and is computed by dividing the total weighted grade points $(\sum_{i=1}^{n} C_i G_i)$ accumulated up to the date by the total credit hours $(\sum_{i=1}^{n} C_i)$.

Both GPA and CGPA will be rounded off to the second place of decimal for reporting.

4) Course Withdrawal: If a student is unable to complete the Semester Final Examination due to illness, accident or any other valid reason, etc. he/she may apply in prescribed form to the Registrar through his/her Adviser and Head of the Department for total withdrawal from the Semester within 5 days after the end of the Semester final examination. However, he/she may choose not to withdraw any laboratory/sessional/design course if the grade obtained in such a course is 'D' or better and that he/she has to indicate clearly in his/her withdrawal application. In case of illness the withdrawal application must be supported by a medical certificate from Registered Expert Medical Officer. The Academic Council will take final decision about such an application. To continue study at SU they will be required to take readmission within two succeeding semesters by paying all dues as per SU rule) in addition to the regular semester fees. This facility in case of withdrawal and readmission can be availed once during the study period. The grade W (Withdrawal) is also assigned when a student officially drops/withdraw course(s) within the date mentioned in the academic calendar for the semester.

5) Incomplete (I) courses: If a student does not register any offered course of a regular semester, then this course is defined as "incomplete course" and he/she can register this course when offered by the department in the subsequent semesters.

6) Retake

(i) If a student fails in either Supplementary Examination or he/she does not attend in Supplementary Examination on a course, then he/she can register this course with the regular offered courses of a semester as a Retake course.

(ii) If any student does not appear both in Mid-Semester Examination and Semester Final Examination on any course, then he/she cannot register the course for supplementary examination; but he/she can register this course with the regular offered courses of a semester as a Retake course.

(iii) If any student does not attend in classes without withdrawal within the time limit (normally up to the time of drop of a course from any semester) will be given the grade "F" in the course and can register as Retake courses.

(iv) All the Retake courses are of grade "F" and are denoted by "R".

7) Grade Improvement

For Grade Improvement we expect students to do well in their regular examinations. It is considered as a privilege, not the right. That is why the improvement fee has been kept at regular rate. The reason for charging such fee is not to consider it as a revenue generation source but to discourage any abuse. However, if a student wishes to improve the grade of any theory course, he/she must register the required course with regular offered courses of any semester within two consecutive semesters after publishing result of the course, provided there is opportunity to attend the classes regularly but no improvement courses can be registered after 4th year 3rd semester or 5th year 3rd semester for 4-year and 5-year degree programs. It will be remembered that a student can register only one improvement course with the offered courses in a regular semester. However, for 4-year and 5-year degree programs, a student may appear in the Improvement Examination on improvement courses (whose grade is below B+) in maximum 7 (seven) and 8 (eight) courses respectively in his/her study period.

For improvement courses the student will earn the marks of continuous assessments in classes and other marks will earn from Mid-Semester and Semester Final Examinations. In this case the transcript of the student will show the higher grade between previous and present grades. For the improvement of any grade of a course up to A- (A minus), the incumbent student may be allowed to repeat only one time for a particular course, which must be registered within next two consecutive semesters after the publication of the results of the course.

If any student wishes to take this privilege, he/she has to take written permission from the Head of the department through coordinator within five days from the date of publication of results and a copy of permission must be attached with the prescribed registration form. Then a student will register the course with regular courses following the rules of SU. It is mentioned that a student cannot register the course(s) for grade improvement which he/she registered any time as repeat/retake/self-study course(s).

(i) A student can register only one improvement course in a regular semester. However, for 4-year and 5-year degree programs a student will appear in Improvement Examinations for grade improvement (whose grade is below B+) in maximum 7 and 8 courses respectively in his/her study period and every course will be repeated one time only. (ii) No improvement examination can be allowed for sessional or sessional related courses. (iii) A student cannot register the course(s) for grade improvement that he/she registered any time as repeat/retake/self-study course(s). (iv) For grade improvement of any course the student must register the course with regular offered courses of any semester within two consecutive semesters after publishing result of the course, but no improvement courses can be registered after 4/5-year 3rd semester for 4/5-year degree programs.

8) Withdrawal from a Semester(dropout)

If a student is unable to complete the Semester Final Examination due to illness, accident or any other valid reason, etc. he/she may apply in prescribed form to the Registrar through his/her Adviser and Head of the Department for total withdrawal from the Semester within 5 days after the end of the Semester final examination. However, he/she may choose not to withdraw any laboratory/sessional/design course if the grade obtained in such a course is 'D' or better and that he/she has to indicate clearly in his/her withdrawal application. In case of illness the withdrawal application must be supported by a medical certificate from Registered Expert Medical Officer. The Academic Council will take final decision about such an application. To continue study at SU they will be required to take readmission within two succeeding semesters by paying all dues (as per SU rules) in addition to the regular semester fees. This facility in case of withdrawal and readmission can be availed once during the study period.